United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with United States Department of Agriculture, Forest Service; United States Department of the Interior, Bureau of Land Management; Oregon Agricultural Experiment Station; and Douglas County

Soil Survey of Douglas County Area, Oregon

How to Use This Soil Survey

General Soil Map

The general soil map, which is a color map, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

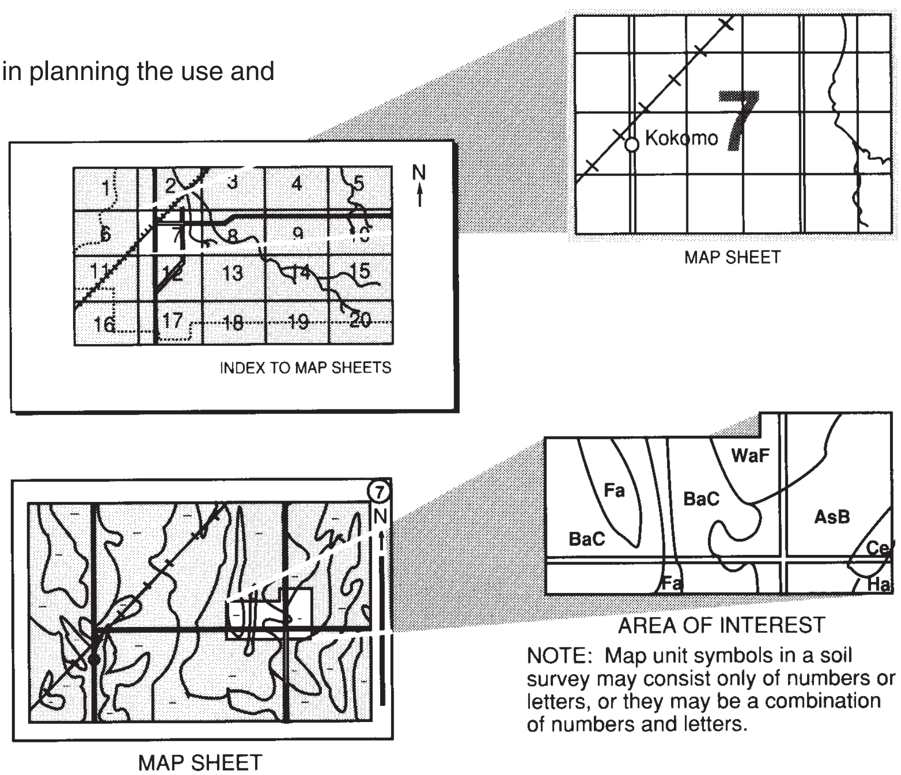
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.



This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1993. Soil names and descriptions were approved in 1994. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1994. This survey was made cooperatively by the Natural Resources Conservation Service and the Forest Service, Bureau of Land Management, Oregon Agricultural Experiment Station, and Douglas County. The survey is part of the technical assistance furnished to the Douglas County and Umpqua Soil and Water Conservation Districts.

Since the publication of this survey, more information on soil properties may have been collected, new interpretations developed, or existing interpretive criteria modified. The most current soil information and interpretations for this survey are in the Field Office Technical Guide (FOTG) at the local Natural Resources Conservation Service field office. The soil maps in this publication are in digital form. The digitizing of the maps is in accordance with the Soil Survey Geographic (SSURGO) database standards. The digital SSURGO-certified maps are considered the official maps for the survey area and are part of the FOTG at the local Natural Resources Conservation Service field office.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: View of the North Umpqua River, near Glide. Mount Scott is in background.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is http://www.nrcs.usda.gov (click on "Technical Resources").

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Issued 2003

Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

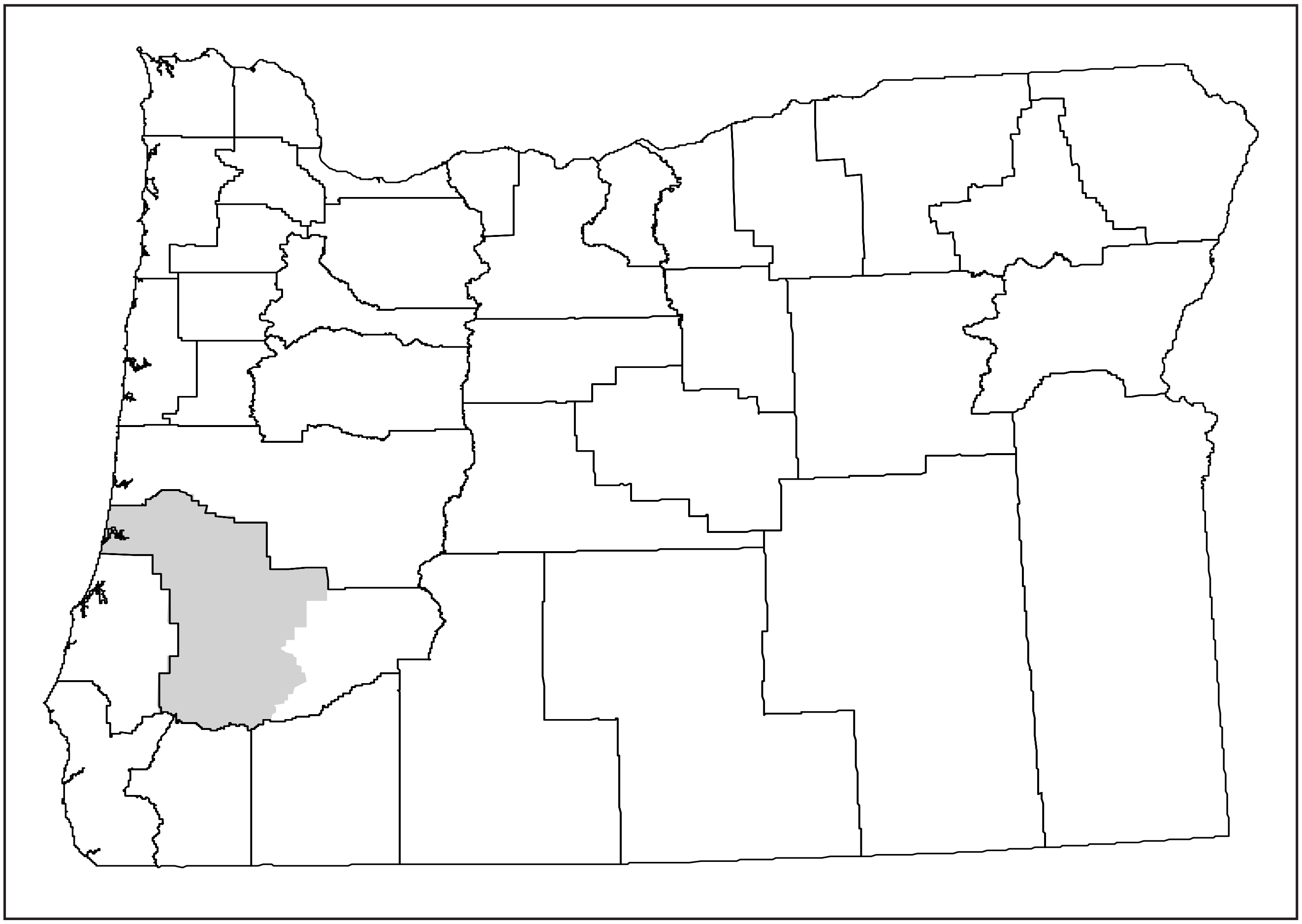
This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Bob Graham
State Conservationist
Natural Resources Conservation Service



Location of Douglas County Area in Oregon.

Soil Survey of
Douglas County Area, Oregon

By David R. Johnson, John T. Haagen, and Alan C. Terrell

Fieldwork by David R. Johnson, Susan L. Reams, David E. Turcotte, John T. Haagen, Alan C. Terrell, Gerry Coleman, Gary Kitzrow, Dennis Holloran, and Jerry Macdonald

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
United States Department of Agriculture, Forest Service; United States Department of the Interior, Bureau of Land Management; Oregon Agricultural Experiment Station; and Douglas County

Douglas County Area is in southwestern Oregon. It encompasses all of Douglas County except the part within the boundaries of the Umpqua, Willamette, and Rogue River National Forests. According to the 1990 census, the total population in the survey area was about 92,000 with 17,932 in Roseburg, the county seat. The total area is 2,259,471 acres, or 3,530 square miles. Of this, about 654,100 acres is managed by the Bureau of Land Management, 64,400 acres in Siuslaw National Forest is managed by the Forest Service, and 35,800 acres in Elliott State Forest is managed by the State Department of Forestry.

An earlier survey, South Umpqua Area, Oregon, was published in 1973 (USDA, 1973). It covers about 200,000 acres of the Umpqua National Forest, in the South Umpqua River Basin in Douglas County. This earlier survey was not updated and published with the present survey.

General Nature of the Survey Area

This section gives general information about the survey area. It discusses history and development; physiography, relief, and drainage; farming; geology; climate; and vegetation.

History and Development

Fred Reenstjerna, research librarian, Douglas County Museum, helped to prepare this section.

Five native Indian tribes inhabited the Umpqua Basin prior to settlement of the area by Euro-Americans. Each tribe occupied distinct geographic areas in the basin and spoke a unique language. The westernmost inhabitants were the Siuslawan-speaking Kuitsh, or Lower Umpqua, Indians, who occupied the coastal area between Fivemile and Tenmile Lakes and upriver to Scottsburg. The Upper Umpqua Indians, who spoke Athabascan, occupied the area from present-day Scottsburg to the Cascade Mountains, along the North Umpqua River. The Kalapuyan-speaking Yoncalla Indians inhabited the Elk and Calapooya Creek drainageways. The Penutian-speaking Takelma Indians, including the Upland and Lowland Takelma Tribes and the Cow Creek Band of the Umpqua Tribe, occupied the Cow Creek drainageway and the upper South Umpqua region. Finally, the Southern Molalla Indians, who spoke Sahaptian, occupied the upper part of the Umpqua Basin, in the Western Cascade Mountains (O’Neill, 1990).

Although there is little recorded information about some of the native tribes, there were probably some similarities among them. Their diets were somewhat similar because of the abundance of similar food resources throughout the basin. In general, all of the tribes subsisted on a variety of fish, shellfish, camas root, nuts, seeds, berries, and wild game. The Kuitsh Indians relied more heavily on marine life and less on hunting than did the interior tribes. All of the tribes maintained permanent winter lodging, and they erected transient camps while gathering food and hunting game. None of the tribes had large tribal governments; they operated instead as small independent bands, each with their own headman (Beckham, 1977).

Life changed dramatically for the Indians when the Euro-Americans arrived in the area. Disease decimated the Indian populations. Although the initial relationship between the Indians and the settlers was peaceful, prospectors sparked unrest in the region. Relations were strained by the resulting Rogue River Wars in 1854 to 1856 and associated skirmishes in the Umpqua Basin (Cornutt, 1971). In 1854, a territorial law was passed that prohibited the sale of firearms and ammunition to the Indians. Settlers and prospectors freely hunted for game, and they allowed their livestock to decimate the camas root and acorn sources (Beckham, 1977). Many Indians surrendered their native homeland and moved to reservations, but small groups stayed in remote areas in the basin.

European interest in the region had begun more than two centuries earlier. In response to the threat of English expansion into the region, the Spanish thrust northward from California in the early 1600's. The first European thought to see the Umpqua River was Martin Aquilar in 1603 (Hogg, 1979). In 1778, James Cook verified Aquilar's sighting of the Umpqua River. Exploration of the land at that time, however, did not go beyond the dense coastal vegetation. It was not until the early 1820's that the interior area was explored by trappers of the Northwest Company and the Hudson's Bay Company. Peter Ogden passed through the basin in 1821 to 1826 while searching for the source of the Umpqua River, then thought to be the Great Basin to the east. In 1826, Alexander McLeod, sponsored by the Hudson's Bay Company, explored and trapped in the land south of the Umpqua River, establishing a rapport with the native people. Botanist David Douglas was among his party (Hogg, 1979). As a result of the increased fur trapping in the area, Fort Umpqua was established by the Hudson's Bay Company near present-day Elkton. In some years, the volume of trade from this fort was similar to that of Fort Vancouver. The first American to pass through Douglas County was Jedediah Smith. He and his party traveled up the Smith River, but they lost a number of men in 1828 in what has become known as the "Smith Umpqua Massacre."

In 1846, Jesse Applegate and Levi Scott blazed the Old South Road, or Applegate Trail, which extended from the Willamette Valley into California. Originally intended as a way to bypass the treacherous Columbia River passage on the Oregon Trail, the Applegate Trail opened the Umpqua Basin to increased settlement (Hogg, 1979). This increased settlement was due in part to the activity in the mining districts in California and southern Oregon and in part to the Donation Land Acts signed by President Polk in 1850. The first Donation Land Act granted 320 acres of land to each American citizen over the age of 18 years who had resided in Oregon since December 1, 1850. Subsequent amendments reduced the amount of land granted to each citizen, but these acts encouraged settlement throughout the Umpqua Basin (Beckham, 1986). Settlers found a favorable climate, heavily forested uplands, lush grasslands, and rich, productive soils. They first settled in some of the more remote areas, such as Tiller and Shoestring Valleys. Subsistence farming commonly was augmented with cottage industries to support the pioneer families. The wagon roads connected the small valleys, and the demand for food and supplies from the mining districts created a market for the settlers (Hennigh, 1975).

In 1852, Douglas and Umpqua Counties were established in the basin. Umpqua County included the main Umpqua River drainageway. By 1862, Douglas County had absorbed most of the land in Umpqua County. Winchester was the first county seat of Douglas County, but in 1864 Aaron Rose's donation land claim, called Deer Creek because of the stream that flowed through it, became the new county seat. It was eventually renamed Roseburg (Hogg, 1979).

In 1851, gold was discovered in Jacksonville, Oregon. Subsequent discoveries throughout southern Oregon and Douglas County stimulated the economy. Considerable placer mining was done along Cow Creek and its tributaries. According to some reports, at least $250,000 in gold was mined (Chandler, 1981). In 1867, commercial quantities of gold and silver were discovered in the Bohemia district in the Calapooya Divide area, north of Roseburg. Because this area was so isolated, however, it was not feasible to develop the area until 1871. Only sporadic activity occurred in the area until 1891, when full-scale operations began (Hogg, 1979).

Early transportation centered on the navigable portion of the Umpqua River, from its confluence with the Pacific Ocean to Scottsburg. The Oregon and California Railroad Grant of 1866 and the Coos Bay Wagon Road Grant of 1872 had a major impact on the development of Douglas County. In 1872, Roseburg became the southern terminus for the Oregon and California Railroad. In 1882, track laid from Roseburg joined with that of the Central Pacific Railroad, connecting Douglas County to national markets. In 1916, all land granted for the railroad and wagon road was revested to the government and the General Land Office of the Department of the Interior became the administrator of the land (Beckham, 1986).

The diverse topography and soils and the favorable climate provided a variety of agricultural opportunities in Douglas County. Subsistence farming in the bottomlands and foothills grew into considerable grain and fruit production by the turn of the century. A prune industry took hold in the early 1890’s, and it flourished for more than 30 years. The local climate was recognized early as favorable for growing grapes, and a productive wine industry still exists. The early settlers found the lush grass on the foothills conducive to raising livestock. A very productive pasture management system was developed, and it supports successful cattle operations and the most productive sheep and lamb operations in Oregon (USDA and Oregon Agricultural Statistics Service, 1990). Turkey farming was an important industry in the Oakland area before World War II. A fishing and cannery industry thrived near Reedsport from the 1870’s until the 1940’s.

The rich timberland in Douglas County has provided an economic base for the area since the 1860’s. The first mills in the area, which consisted of hand-operated whipsaws run by settlers, were the precursors to larger mill operations, such as the Gardiner Mill Company started in 1864. These large mills were located near water sources to facilitate logging activities and the transport of the finished products to distant markets. Initially, logging occurred on timberland immediately adjacent to coastal streams. As logging progressed further inland, loggers depended on runoff from precipitation in fall and winter to drive logs downstream for transport to the mills. Development of the steam donkey engine and construction of railroads improved logging operations considerably. By the end of World War II, timber on much of the private forestland had been harvested. The Umpqua National Forest and the revested land became important sources of timber for the nation. The postwar building boom, the availability of heavy equipment, and the rising price of lumber resulted in a thriving and expanding timber industry in Douglas County. The local government, which received a percentage of the income from the public timber sales in the county, benefited by the increased revenue. The surge peaked in 1980, when Douglas County received a total of $24.6 million in revenue from public land.

With the advent of the Federal sustained yield and multiple use mandates in the 1960’s, forest practices and public land management changed. In addition, unsteady market conditions have resulted in a fluctuation in the supply and demand for wood products (Beckham, 1986).

The economy of Douglas County has diversified beyond wood products in recent years. Transportation to west coast markets and other shipping points is available through the numerous trucking companies utilizing U.S. Interstate 5 and State Highways 42 and 38, the Southern Pacific Railroad, and the Roseburg Municipal Airport. Small businesses and service industries continue to grow in the area because of the favorable climate, attractive setting, available labor force, abundance of raw materials, available commercial real estate, easy access to transportation corridors, and a growing retirement community. The abundant recreational resources on the public land administered by the Bureau of Land Management and the Forest Service continue to attract travelers, resulting in a lucrative tourist industry (Cubic and Tribble, 1989).

Physiography, Relief, and Drainage

The survey area can be divided into six geographic areas. Three of the areas are recognized as distinct geographic provinces—the Klamath Mountains, the Coast Range Mountains, and the Western Cascade Mountains (Franklin and Dyrness, 1973). The other three areas are considered significant subdivisions of the Klamath Mountains and Coast Range Mountains provinces. The six geographic areas are shown in figure 1. Each of the geographic areas has unique geologic, climatic, topographic, vegetative, and soil features.

The Klamath Mountains geographic area makes up the southern part of the survey area. This geographic area consists dominantly of mountains with ridges and steep side slopes. Elevation ranges from 800 to 5,000 feet or more. The area is drained by Cow Creek, the South Umpqua River, and the Middle Fork of the Coquille River. Typically, the climate is characterized by warm, wet winters and hot, dry summers. The highest elevations have cool, wet winters and warm, moist summers. Conifer forests are dominant in this area, but there are scattered areas of grassland and oak savannah.

The Western Cascade Mountains geographic area makes up the eastern part of the survey area. This geographic area is dominantly gently sloping plateaus

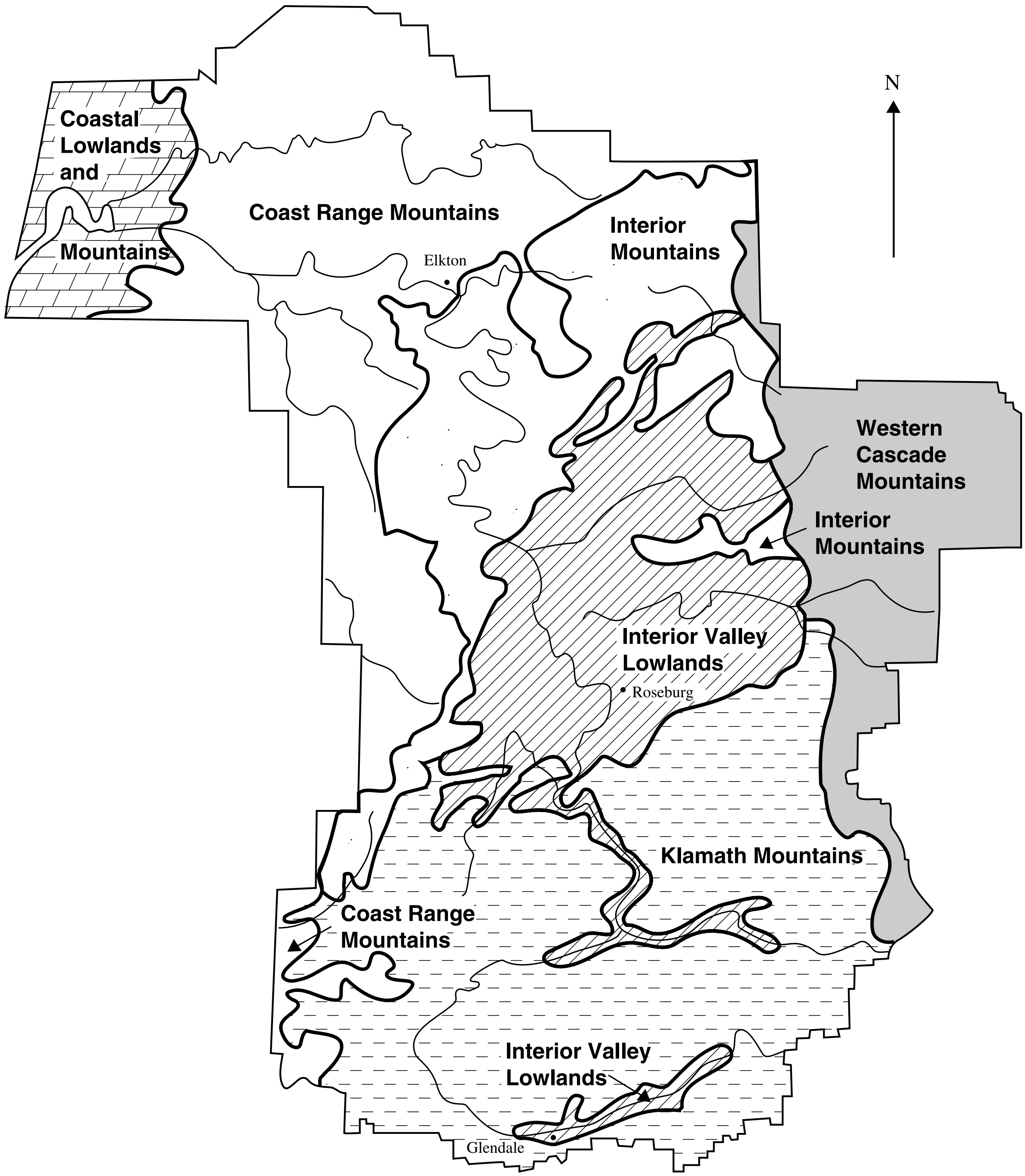


Figure 1.—Geographic areas of the survey area.

to steep side slopes. Elevation ranges from 800 feet to nearly 5,000 feet. The area is drained by the North Umpqua River, Little River, and South Umpqua River. Typically, the climate is characterized by warm, wet winters and hot, moist summers. The highest elevations have cool, wet winters and warm, moist summers. Conifer forests are dominant.

The Coast Range Mountains geographic area makes up the western part of the survey area. This geographic area is dominantly narrow to broad ridges and gently sloping to steeply sloping side slopes. Elevation ranges from 50 feet to nearly 3,300 feet. The area is drained by the Smith River, tributaries of the main stem of the Umpqua River, Camp Creek, Lake Creek, and headwaters of the Williams River and the Middle Fork of the Coquille River. Typically, the climate is characterized by warm, wet winters and hot, moist summers. The highest elevations have cool, wet winters and warm, moist summers, and some of the south-facing slopes at the southern end of this area have hot, dry summers. Conifer forests are dominant.

The Coastal Lowlands and Mountains geographic area is considered to be a subdivision of the Coast Range Mountains province. This area consists of sand dunes, flood plains, terraces, and mountainsides. The sand dunes are nearly level to steeply sloping. The flood plains and terraces are nearly level. The rest of the area consists of narrow ridges and gently sloping to steeply sloping side slopes. Elevation ranges from 0 to 1,300 feet. The upland areas are drained by tributaries of the Umpqua River. The climate is affected by marine air year round, and it typically is characterized by cool, wet winters and cool, moist summers. Although most of the sand dunes do not support trees, some areas are covered with coniferous trees. The flood plains and terraces are used primarily for hay and pasture. Conifer forests are dominant in the mountainous areas.

The Interior Mountains geographic area is considered to be a subdivision of the Klamath Mountains province. This area consists of gently sloping to very steep mountainsides. Elevation ranges from 250 to 2,600 feet. The area is drained by Elk Creek, Calapooya Creek, and the Middle Fork of the Coquille River. Typically, the climate is characterized by warm, wet winters and hot, dry summers. Although conifer forests are dominant, some areas do not support forests or support only sparse forests.

The Interior Valley Lowlands geographic area is considered to be a subdivision of the Klamath Mountains province. This area consists of the nearly level or gently sloping flood plains and terraces of the North and South Umpqua Rivers and the adjacent gently sloping to steep footslopes and surrounding hills. Elevation ranges from 350 to 2,200 feet. The area is drained by Elk Creek, Calapooya Creek, Lookingglass Creek, and the North and South Umpqua Rivers. This geographic area has the lowest annual precipitation in the survey area, and the climate is characterized by warm, wet winters and hot, dry summers. Most of the footslopes and surrounding hills support grassland, oak savannah, or sparse forests. Some areas, mainly on north-facing slopes, support coniferous forests.

Farming

Rodney McCoy, Douglas County extension agent, Oregon State University, helped to prepare this section.

Farming in the survey area is limited to flood plains, terraces, and footslopes and to gently sloping areas of hills. The soils on the flood plains and terraces are fertile and are suitable for growing vegetables, alfalfa, wheat, oats, cane fruit, and fruit and nut trees. The main limitations for growing vegetables are the limited heat units because of the cool temperatures at night and the limited availability of irrigation water. These soils are well suited to growing grass-clover hay and pasture. Grass seed, subterranean clover seed, wheat, and oats are grown on the terraces, footslopes, and side slopes. Grapes are grown in the moderately deep and deep soils on the south aspects of terraces, footslopes, and side slopes. Christmas trees are grown on the footslopes and hills. Summers are dry on the footslopes and hills; therefore, cropping is limited to perennial plants that are tolerant of droughtiness.

Livestock production is the major farming and ranching enterprise in the survey area. Beef cows, feeder cattle, and sheep are raised on the terraces, footslopes, and side slopes. Sheep are better able to graze on the pastures on hills, including the steepest slopes, and cattle use the pastures on the less steep side slopes.

Geology

The geologic history of Oregon began with the formation of the Klamath Mountains. The stratigraphy of these mountains is very complex because of the age of the rock and the geologic activity that has taken place since the rock formed. The origin of the mountains can be traced to a volcanic island arc, or peninsula, that was adjacent to the ancient shoreline of North America during the Triassic period (Alt and Hyndman, 1981). During this time, the Pacific Ocean plate began to subduct beneath the North American plate. The lighter sediment of the Pacific Ocean plate was scraped onto the margin of the North American plate and was metamorphosed with the volcanic rock already present to form the Dothan (fig. 2), Galice, and Otter Point Formations (Baldwin, 1981). Granitic and serpentinitic rock also intruded into the area.

Early in the Cretaceous period, shoreline and stream deposits originating from the Klamath Mountains formed in basins and were later faulted and slightly metamorphosed, adding more rock to the

Figure 2.—Area of the Dothan Formation, consisting of metamorphosed sedimentary rock of the Klamath Mountains.

mountains to form the Riddle and Days Creek Formations. Most areas of the Klamath Mountains have been eroded into a ridge and ravine landscape pattern, but some hills are at the northern end. Because of the complex stratigraphy, many different soils are in these mountains.

The Coast Range Mountains, Interior Mountains, and Interior Valley Lowlands consist of sedimentary and volcanic rock that originally was laid down on an embayment floor on the Pacific Ocean plate immediately offshore from the North American plate. This rock originated during the Eocene epoch, when submarine flows, breccia, and tuffaceous sediment from ancient offshore volcanoes intermingled with sediment from the Klamath Mountains on the embayment floor. Sills and dikes of volcanic flows intruded into the marine sediment on the embayment. During the Oligocene epoch, the Pacific Ocean plate subduction zone shifted to its present course off the Oregon Coast (Alt and Hyndman, 1981). Consequently, the embayment was uplifted as the Pacific Ocean plate subducted beneath it, exposing the sedimentary rock and pillowed basalt of the Roseburg Formation (figs. 3 and 4), the sedimentary rock of the Lookingglass and Flournoy Formations, and the sedimentary rock and volcanic sills and dikes of the Tyee, Elkton, and Bateman Formations (Baldwin, 1981). Erosion has reduced most of the Roseburg, Lookingglass, and Flournoy Formations to hills that occupy the Interior Valley Lowlands; however, the Tyee, Elkton, and Bateman Formations have been dissected to the very

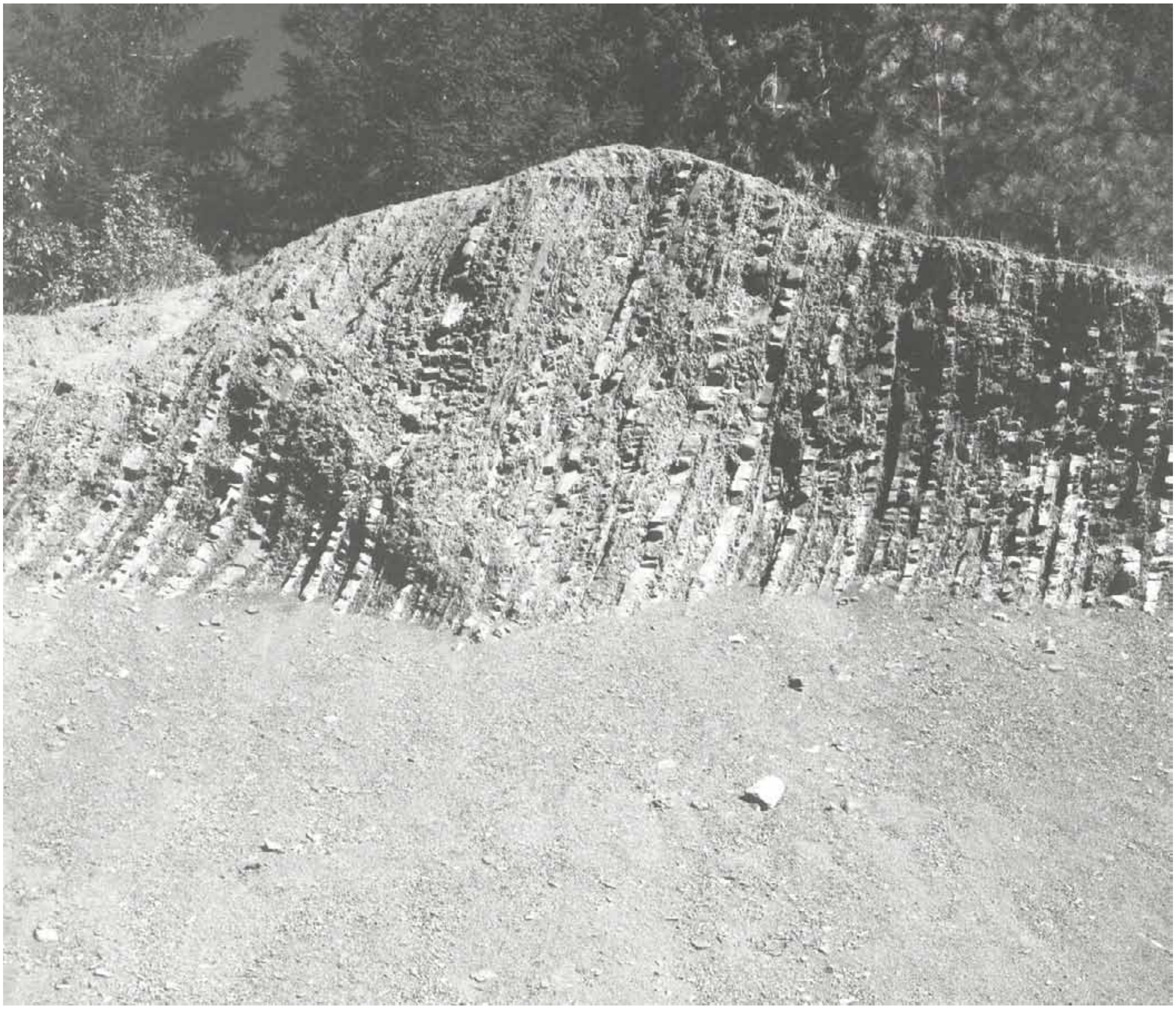


Figure 3.—Area of the Roseburg Formation, consisting of tilted siltstone beds of the Eocene epoch.

steep canyons, narrow to broad ridges, and high basaltic peaks of the Coast Range Mountains and the higher elevations of the Coastal Lowlands and Mountains.

The Western Cascade Mountains consist of volcanic rock that originated from a string of volcanoes on the edge of North America. The volcanism originated during the Eocene epoch, as the Pacific Ocean plate subducted beneath the North American plate, and continued through the late Miocene epoch. The volcanoes produced dark basalt and andesite lava, andesitic breccia, and light-colored ashflow tuff, forming the Colestine and Fisher Formations and the Little Butte Volcanics (Alt and Hyndman, 1981). The old volcanic vents have since been eroded away. The softer ashflow tuff formed plateaus, and the hard basalt eroded into a landscape pattern of ridges and ravines.

During the Pleistocene epoch, some local glaciation at the higher elevations resulted in the deposition of glacial outwash. Some remnants of these deposits are on high terraces along drainageways of the Western Cascade Mountains (Reckendorf, 1987). A few scattered remnants of alluvial deposits from this epoch are in the Klamath Mountains, along Cow Creek and the South Umpqua

Figure 4.—Area of the Roseburg Formation, consisting of pillowed basalt of the Eocene epoch.

River. Marine terraces formed along the Pacific Ocean as the sea level lowered; thus, high marine terrace remnants are within the Coastal Lowlands and Mountains (Nettleton and others, 1982).

During the Holocene epoch, alluvium was deposited on the terraces and flood plains along streams in the Interior Valley Lowlands (Reckendorf, 1987). Low marine terraces formed and sand dunes were deposited along the lower elevations of the Coastal Lowlands and Mountains (Nettleton and others, 1982).

Climate

Prepared by the National Water and Climate Center, Natural Resources Conservation Service, Portland, Oregon.

Data for the climate tables were recorded at Elkton, Idleyld Park, Riddle, Roseburg, and North Bend, Oregon. Thunderstorm days, relative humidity, percent sunshine, and wind information were estimated from data recorded at First Order stations in Eugene and Medford, Oregon. Other climate data were obtained from maps of the Parameter-elevation

Regression on Independent Slopes Model (PRISM) (Daly, 1994).

Table 1 gives data on temperature and precipitation for the survey area as recorded at Elkton, Idleyld Park, Riddle, and North Bend during the period 1961 to 1990 and at Roseburg during the period 1966 to 1990. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on the length of the growing season. Extremes are based on a period of record that dates back to 1948 at Elkton and Riddle, 1958 at Idleyld Park, 1966 at Roseburg, and 1931 at North Bend.

In winter, the average temperature is 43.6 degrees F at Elkton, 40.5 degrees at Idleyld Park, 42.7 degrees at Riddle, 42.6 degrees at Roseburg, and 46.3 degrees at North Bend. The average daily minimum temperature in winter is 36.9 degrees at Elkton, 32.7 degrees at Idleyld Park, 34.8 degrees at Riddle, 35.2 degrees at Roseburg, and 39.8 degrees at North Bend. The lowest temperatures on record were 0 degrees at Elkton and -1 degree at Idleyld Park on December 8, 1972; -3 degrees at Riddle on January 22, 1962; 3 degrees at Roseburg on December 21, 1990; and 13 degrees at North Bend on December 21, 1990.

In summer, the average temperature is 66.1 degrees at Elkton, 64.0 degrees at Idleyld Park, 66.4 degrees at Riddle, 67.0 degrees at Roseburg, and 58.9 degrees at North Bend. The average daily maximum temperature in summer is 81.5 degrees at Elkton, 80.3 degrees at Idleyld Park, 81.3 degrees at Riddle and Roseburg, and 65.7 degrees at North Bend. The highest temperatures on record were 108 degrees at Elkton on July 11, 1961; 104 degrees at Idleyld Park on August 8, 1978; 110 degrees at Riddle on August 17, 1977; 109 degrees at Roseburg on July 18, 1998; and 96 degrees at North Bend on July 6, 1931.

Growing degree days are shown in table 1. They are equivalent to “heat units.” During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The average annual precipitation is highly variable in this very diverse survey area. The highest is along the coast and in the Coast Range Mountains, west of Elkton. The average annual precipitation in these areas ranges from 60 to 80 inches, and the average is 63.78 inches at North Bend, in nearby Coos County. East of the Coast Range Mountains, the average annual precipitation ranges from 40 to 60 inches, and the average is 51.47 inches at Elkton. The central valleys receive 30 to 40 inches, and the average is 30.41 inches at Riddle and 32.40 inches at Roseburg. In the foothills east of Roseburg and Myrtle Creek, the average annual precipitation ranges from 40 to 65 inches, and the average is 62.91 inches at Idleyld Park, near the National forest boundary. Precipitation in the southern part of the survey area varies with elevation. The average annual precipitation ranges from 30 inches in the lowest valleys to about 60 inches on the highest peaks. The amount of precipitation that falls during the growing season (April to October) in the central part of the survey area, near Roseburg, is about 9 inches, which is less than 30 percent of the total precipitation received. The heaviest 1-day rainfall during the periods of record was 6.36 inches at Elkton on December 7, 1981; 6.72 inches at Idleyld Park on November 22, 1961; 3.86 inches at Riddle on October 29, 1950; 4.35 inches at Roseburg on November 19, 1996; and 6.67 inches at North Bend on November 18, 1996. Thunderstorms occur on about 5 days each year, and most occur in May through September.

The average seasonal snowfall is dependent on location. Most low-elevation areas, including inland areas, receive an average of 3 to 6 inches annually, and no snow is received in many years. Measurable snowfall was received at Elkton in only 1 year during the period 1976 to 1990, and at Roseburg in only 4 years during the same period. Snowfall is higher at the higher elevations, particularly in areas above 2,000 feet. Idleyld Park, at 1,080 feet, receives 21.8 inches of snowfall annually, and it has received at least some measurable snowfall every year since 1958. Areas at 3,000 feet receive an estimated 30 to 50 inches of snow annually. The greatest snow depths at any one time during the periods of record generally occurred late in January of 1969. The maximum snow depth was 33 inches at Elkton, 26 inches at Idleyld Park, 27 inches at Roseburg, and 9 inches at Riddle and on the coast at North Bend. On an average, less than 1 day per year has at least 1 inch of snow on the ground at elevations of less than 1,000 feet. At Idleyld Park, an average of 14 days per year have some snow on the ground. On an average, 30 to 60 days have some snow on the ground at elevations above 2,000 feet. The heaviest 1-day snowfall, recorded late in January of 1969, was 18.0 inches at Elkton, 13.5 inches at Roseburg, and 8.0 inches at North Bend. At Idleyld Park, the heaviest 1-day snowfall, 12.0 inches, occurred on December 30, 1964. At Riddle, the heaviest 1-day snowfall, 8.0 inches, was recorded on January 13, 1971.

The average relative humidity in midafternoon is about 80 percent in winter and 30 percent in summer, except along the coast, where humidity in the afternoon is about 70 percent year round. Humidity is higher at night, and the average at dawn is about 90 percent at most locations throughout the year. In the inland areas, the sun shines about 80 percent of the time possible in summer and 30 percent in winter. Along the coast, the sun shines about 50 percent of the time possible in summer and 35 percent in winter. The prevailing wind varies according to location. Generally, the average windspeed in the survey area is among the lowest in the entire nation. It is 4 to 6 miles per hour, except along the coast where it is about 10 miles per hour. The average windspeed is highest in spring and early in summer in the inland valleys, and it is highest in winter along the coast.

Vegetation

Gene Hickman, range conservationist, Natural Resources Conservation Service, prepared this section.

Southwestern Oregon is a very diverse ecological region. The diversity of the vegetation is primarily the result of dramatic climatic gradients, such as that between the moist Pacific Coast and the cold Cascade Mountains. Another regional climatic gradient is a result of latitudinal changes north to south. It ranges from the mild climate of the Willamette Valley to the hot climate of northern California. Because of the mountainous topography, there are also numerous localized climatic transitions that make the relationship of macroclimate with vegetation and landscape even more complex.

In addition, a wide variety of soils and related geologic features directly affect local plant distribution and the resulting plant communities. Some types of rock, such as serpentinitic rock, uniquely affect the chemical properties of associated soils, thus significantly affecting the production and composition of the plant community. Other characteristics important to plant adaptation and growth are the depth, texture, and drainage of a soil and the amount of rock fragments in the soil. These features work together to either restrict or facilitate vegetative development to the maximum extent possible under the prevailing climate.

Topography, elevation, steepness of slope, and aspect are other landscape features that affect the local microclimate and thus the plant cover. Drainageways and adjacent toeslopes support a more moist vegetative type than do uplands. North-facing slopes receive less direct sunlight and support plant communities that are less tolerant of droughtiness than do south-facing slopes. At high elevations, soils on all aspects support species that are more tolerant of cold temperatures. These elevational variations in vegetation generally correlate with differences in precipitation, length of growing season, amount of snowfall, and temperature. Latitude affects the elevation at which these changes occur. Equivalent ecological changes occur at much higher elevations moving from north to south. There is a similar elevational increase moving inland (west to east) from the coastline to the Cascade Mountains.

In southwestern Oregon, broad ecological subdivisions have been recognized. These subdivisions are within regional provinces defined by Daubenmire (Daubenmire, 1968) and described locally by Franklin and Dyrness (Franklin and Dyrness, 1973). Franklin and Dyrness recognized four subdivisions—the Sitka spruce coastal forests, western hemlock forests of the Cascade and Coast Range Mountains, mixed conifer-mixed evergreen forests, and the interior valleys of the Rogue and Umpqua Rivers. The survey area spans all of these subdivisions with diverse climatic, geologic, topographic, and edaphic characteristics. The landscape and climatic features create a wide variety of contrasting environments with the potential for supporting diverse native plant communities, which are grouped into vegetation zones. These zones represent the major macroclimatic environments.

Vegetation zones may cover large geographic areas, but a single set of potential native plant communities is throughout each zone. Vegetative patterns commonly are predictable within a zone because they are related to local landscape features such as aspect, soil, and landform. Vegetation zones can be used to focus on specific geographical differences in climate and vegetation and to generalize complex local vegetation patterns. The vegetation zones in the survey area are described in this section and are shown on the General Vegetation Zone Map provided with this survey.

Northern Coastal Fog Zone

The Northern Coastal Fog Zone parallels the Pacific Ocean coastline in a belt about 10 to 12 miles wide. The climate in this zone is very mild, and it does not have wide extremes in temperature as do the inland areas. The temperature is moderated by coastal fog and frequent cloudy weather. The average annual precipitation is about 70 to 90 inches, and elevation ranges from sea level to about 1,500 feet. The soils have a udic moisture regime and an isomesic temperature regime. General soil map units 1, 2, 3, and 4 are in this zone.

This zone can be subdivided into two parts based on the prevalence of Sitka spruce. The western part of the zone is adjacent to the ocean and is more affected by marine fog and salt spray. It encompasses the beaches, dunes, marine terraces, and mountain fronts most exposed to the coastal weather. This part supports shore pine and Sitka spruce. The spruce typically is intermingled with Douglas fir, western hemlock, western redcedar, red alder, and cascara buckthorn, but it also occurs in nearly pure stands. Western swordfern, salmonberry, vine maple, and salal are some common understory plants.

The eastern part of the zone is made up of mountains. This part does not support shore pine, and Sitka spruce is not as prevalent in this part. The forests consist primarily of western hemlock, Douglas fir, Sitka spruce, and hardwoods such as red alder, bigleaf maple, and cascara buckthorn. A very dense shrub understory is on both the north- and south-facing slopes. It consists of Pacific rhododendron, evergreen huckleberry, vine maple, creambush oceanspray, western hazel, red huckleberry, and salal. Western redcedar is in moist areas, and some golden chinkapin is in upland areas.

Dense stands of red alder regeneration develop in this zone following disturbances such as fire or timber harvesting. Tree plantations are subject to severe plant competition from hardwood trees and evergreen and deciduous shrubs.

Western Hemlock Zone

The Western Hemlock Zone includes much of the Coast Range and Western Cascade Mountains. The average annual precipitation is about 55 to 110 inches. Summer fog and cloudy weather reduce the rate of evapotranspiration in this zone. Elevation generally is less than 2,000 feet in the northern part of the survey area, but it ranges to about 4,000 feet in the southern and eastern parts. The soils have a udic moisture regime and a mesic temperature regime. General soil map units 19, 20, 21, 23, and 24 are in this zone.

This zone can be subdivided into two parts based on the presence or absence of grand fir. The northwestern corner does not support grand fir in the plant community. It is in the Coast Range Mountains and is influenced by the coastal climate. The part of this zone that supports grand fir in the plant community is a transitional area adjacent to the Grand Fir Zone in the Western Cascade and Coast Range Mountains. This area has sufficient moisture to support western hemlock as a dominant tree species, but it is influenced by an interior climate that has drier and warmer periods in summer.

Douglas fir is an important co-dominant species in the Western Hemlock Zone. Western redcedar, golden chinkapin, and hardwoods such as red alder, bigleaf maple, and cascara buckthorn are also in the overstory. Common understory species include western swordfern, oxalis, vine maple, currant, western hazel, creambush oceanspray, Pacific rhododendron, salal, red huckleberry, cascade Oregongrape, and evergreen huckleberry.

As in the Northern Coastal Fog Zone, dense stands of red alder regeneration develop in this zone following disturbances such as fire or timber harvesting. Tree plantations are subject to severe plant competition from hardwood trees and evergreen and deciduous shrubs.

Grand Fir Zone

The Grand Fir Zone is a transitional climatic belt between the moist Western Hemlock Zone and the dry Interior Valleys and Foothills Zone. It is a continuous belt around the Interior Valleys and Foothills Zone except at the southern end of the survey area, near Canyonville. The Grand Fir Zone is made up of mountains and foothills that have an average annual precipitation of 40 to 55 inches. Elevation generally is less than about 3,200 feet. The soils have a mesic temperature regime and a xeric moisture regime bordering on udic.

Douglas fir is dominant in most of the older stands in this zone. Grand fir is dominant or co-dominant on the north-facing slopes in nearly level areas, and it decreases in dominance on south-facing slopes in areas of droughty soils. Golden chinkapin commonly occurs on north-facing slopes, normally in tree form. Pacific madrone and in some areas California black oak are common, especially on south-facing slopes. Western redcedar may occur in areas that receive supplemental moisture from run-on. Western hemlock may occur on steep, north-facing slopes that are cooler and have a lower rate of evapotranspiration. A lack of moisture in summer restricts the growth of western hemlock.

Numerous valleys, south-facing slopes, and foothill areas are within the Grand Fir Zone. The droughty, clayey, or wet soils favor white oak savannah and restrict the development of coniferous forests. Most of these areas are small in size; however, two large areas are near Elkton and Camas Valley.

Understory shrubs on north-facing slopes include salal, cascade Oregongrape, western hazel, creambush oceanspray, red huckleberry, western prince’s pine, whipplevine, yerba buena, and hairy honeysuckle. The south-facing slopes also support these shrubs, but red huckleberry, cascade Oregongrape, and salal are less abundant because of droughtiness. Grasses and poison oak are more prevalent on south-facing slopes; thus, the plant community more closely resembles that of the Interior Valleys and Foothills Zone.

The Grand Fir Zone can be divided into two parts. The vegetation in the northern part is ecologically similar to that of the southern Willamette Valley foothills, and the vegetation in the southern part is ecologically similar to that of Josephine and Jackson Counties. The southern part from about Roseburg south has more floristic diversity. The vegetation in this part includes California black oak, sugar pine, ponderosa pine, canyon live oak, incense cedar, and various grasses. These species are of minor extent or are absent in the part north of Roseburg.

Interior Tanoak Zone

The Interior Tanoak Zone occurs only at the extreme southern end of the survey area. It represents the northernmost extent of a large ecological zone that extends south into northern California. This zone is made up of mountains, and the average annual precipitation is about 45 to 75 inches. Elevation generally is less than 3,200 feet. The soils have a mesic temperature regime and a xeric moisture regime. Although the moisture and temperature regimes are the same as those of the Grand Fir Zone and the average annual temperature is the same or higher, the number of consecutive dry days in summer is significantly higher in the Interior Tanoak Zone. This zone is characterized by an abundance of tanoak, which occurs in the form of trees on north-facing slopes and in the form of shrubs on south-facing slopes. This exhibits the dramatic environmental difference between these slopes. Douglas fir, the primary associated tree species, generally is dominant in the stand. The species composition of this zone is similar to that of the Grand Fir Zone except for the presence of tanoak; however, Pacific madrone, sugar pine, ponderosa pine, incense cedar, California black oak, and canyon live oak are more prevalent in this zone. Golden chinkapin trees are a component of the plant community on some north-facing slopes.

The shrub cover is similar to that of the Grand Fir Zone except for the presence of evergreen huckleberry on north-facing slopes. Pacific poison oak and canyon live oak trees and shrubs commonly are present on south-facing slopes.

The Interior Tanoak Zone has important implications to forest management. Tanoak and Pacific madrone readily sprout after timber harvesting or burning. Canyon live oak also sprouts, but it is less of a competitor and is more prevalent on soils that have a high content of rock fragments.

Golden Chinkapin Zone

Immediately east of the Interior Tanoak Zone is the Golden Chinkapin Zone. This zone represents the northernmost extent of a larger ecological zone that extends south into northeastern Josephine County and northwestern Jackson County. This zone is made up of mountains, and it has an average annual precipitation of about 35 to 60 inches. Elevation generally is less than 3,200 feet. The soils have a mesic temperature regime and a xeric moisture regime. The climate and vegetation in this zone are similar to those of the Grand Fir Zone except for the presence of golden chinkapin instead of tanoak in the plant community.

Cool Western Hemlock Zone

This zone encompasses the high-elevation mountain peaks and ridges. The elevation in this zone varies depending on latitude and longitude. The elevation in the Coast Range Mountains ranges from about 1,500 feet in the northern part to about 3,000 feet in the southern part. The elevation in the Western Cascade Mountains ranges from about 3,000 to 4,600 feet. The average annual precipitation is about 60 to 120 inches, most of which falls in the form of snow. The soils have a frigid temperature regime, and most areas have a udic moisture regime. The soils at an elevation of more than 3,800 feet typically have a cryic moisture regime. This zone occurs as small, isolated mountain peaks and narrow ridges; therefore, because of the small scale used many areas could not be delineated on the general soil map or the general vegetation zone map. General soil map units 22 and 25 are in this zone.

The overstory vegetation generally consists of western hemlock, grand fir, and Douglas fir and at the higher elevations, western white pine, noble fir, and Pacific silver fir. In the southern part of the survey area, Douglas fir, golden chinkapin, and tanoak make up the overstory. The understory is dominantly Pacific rhododendron, western prince’s pine, common beargrass, salal, and cascade Oregongrape.

Cold temperatures and a short growing season in this zone restrict the growth rate of trees and restrict regeneration. Areas that have been harvested or burned develop fields of dense brush.

Interior Valleys and Foothills Zone

This zone encompasses the driest and warmest climatic areas in the survey area. It is made up of hills and low mountains of the Cascade and Coast Range Mountains. Interspersed with the hills and mountains are numerous valleys that are characterized by terraces and flood plains. The average annual precipitation is about 30 to 50 inches. The soils have a mesic temperature regime and a xeric moisture regime.

The vegetation on the hills and mountains is variable. It is affected by the soil characteristics that determine the water holding capacity, such as depth, texture, and content of rock fragments. Soils that have a moderate to high water holding capacity support Douglas fir, Pacific madrone, bigleaf maple, California black oak, ponderosa pine, incense cedar, and Oregon white oak. Soils that have a low to moderate water holding capacity support Pacific madrone, Oregon white oak, California black oak, and smaller amounts of Douglas fir, ponderosa pine, and incense cedar. Soils that have a very low to low water holding capacity support only scattered Oregon white oak and grasses or shrubs such as wedgeleaf ceanothus and Pacific poison oak.

The vegetation on the terraces and flood plains is dependent on soil texture and drainage. The overstory vegetation consists of black cottonwood on the deep, sandy and gravelly soils on flood plains and dominantly Oregon white oak and Oregon ash on the poorly drained, clayey soils on flood plains and terraces. The deep, well drained soils on terraces support Douglas fir, bigleaf maple, and incense cedar. The understory vegetation also is dependent on soil conditions, but common snowberry and Pacific poison oak generally are in the understory along with vine maple, mockorange, viburnum, Pacific ninebark, blue elderberry, creambush oceanspray, and western hazel.

The natural vegetation in this zone has been affected by settlement and grazing. Large areas have been converted to cropland and improved pastureland. To control shrubs such as rose, Pacific poison oak, blackberry, Scotch broom, and hawthorn, brush management is needed in the upland areas that have been cleared of hardwood or coniferous forests for use as improved nonirrigated pastureland.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Survey Procedures

The procedures followed for this survey are described in the National Soil Survey Handbook (Available at the State office of the Natural Resources Conservation Service, Portland, Oregon). References used in the development of the survey were the “Douglas County Flood Plain Information, Interim Report,” published in 1966 by the Corps of Engineers, Portland District; the “Flood Insurance Rate Map of Douglas County, Oregon,” published in 1986 by the Federal Emergency Management Agency (FEMA); the “Preliminary Geologic Map of the Medford Quadrangle, Oregon and California,” published in 1972 by the Oregon Department of Geology and Mineral Industries; the “Map of Eocene Stratigraphy of Southwest Oregon” published in 1974 by the Oregon Department of Geology and Mineral Industries; the “Compilation Geologic Map of Southern Tyee Basin, Southern Coast Range, Oregon,” published in 1990 by the Oregon Department of Geology and Mineral Industries; and the memorandum of understanding agreed upon by the Natural Resources Conservation Service, the Forest Service, the Bureau of Land Management, the Oregon Agricultural Experiment Station, and Douglas County.

The slope gradients and aspect on the hills and mountains generally were determined by examination of contour lines on U.S. Geological Survey 7.5-minute topographic maps.

The soils in the survey area were mapped by soil scientists who used field observations and their knowledge of soil-vegetation-landscape relationships to predict soil patterns on landscape positions. The general soil-vegetation-landscape concepts, or models, developed by field soil scientists are described in detail in the section “Formation of the Soils.” Traverses and transects were used on various landforms to confirm the soil-vegetation-landscape concepts and to check the accuracy of the concepts by examining tonal patterns on aerial photographs. The traverses were made by truck or by foot. The soil was examined when changes in characteristics were apparent. In areas where the soils varied considerably, many traverses were made at short intervals.

Transects of the map units were made randomly so that the soil scientists could determine the composition of the dominant soils and the included areas. The soil scientists generally crossed the areas on foot, following a course that had been charted on aerial photographs. The soil characteristics were examined and documented at regular intervals.

The survey area was mapped at two levels of intensity. A more detailed level was used to map the alluvial soils and the soils on low foothills, which are under intensive agricultural and urban development. Maps published by the Corps of Engineers and the Federal Emergency Management Agency were used as an aid in determining the boundaries of the flood plains. The minimum size of the map unit delineations was 5 acres. About 17 percent of the survey area was mapped at the detailed level.

A less detailed level of mapping was used on the gently sloping to very steep uplands. These soils formed in various kinds of parent material. They are used as woodland and for hay and pasture. Generally, the minimum size of the delineations was about 40 acres, but the delineations are as small as 10 acres in areas that are considered to be of importance for management. About 83 percent of the survey area was mapped at the less detailed level.

Spot symbols are used on the maps to identify contrasting soils and miscellaneous areas that are less than 5 acres in size. The contrasting soils or miscellaneous areas that are included in mapping are described in the section “Detailed Soil Map Units” if they are of significant extent.

In some areas, soil scientists were denied access to private property. If the inaccessible area was small, soil scientists were able to use their knowledge of the soil-vegetation-landscape relationships and observations of soil profiles on similar adjacent landscape positions to predict the kinds of soils and the boundaries of the map units on inaccessible landscape positions. These small areas are mapped similarly to the accessible areas. For large inaccessible areas, however, soil scientists were not able to predict the soil profiles or the map unit boundaries because of the dissimilar geology, climate, plant community, or landscape position of adjacent areas. These large areas are identified on the maps as “DA” for denied access.

Soil samples for chemical and physical analyses were taken from typical pedons of some of the major soils in the survey area. The analyses were made by the National Soil Survey Laboratory in Lincoln, Nebraska, and by the Soils Laboratory at Oregon State University. The results of the analyses were used in classifying the soils, in determining the fertility and erodibility of the soils, and in making various interpretations for engineering and agricultural uses and for other land uses.

Soil-plant relationships were evaluated during the development of the detailed soil map unit descriptions. Foresters assisted in measuring the potential for timber production at representative forested sites. Soil and range conservationists assisted in collecting yield data for crops and forage on farms and in areas of native pasture and assisted in determining the potential productivity of the soils. The data were then correlated with the kinds of soil and the site characteristics of the map units. The results were used to predict the productivity of various map units in the survey area.

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one map unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

Soils of the Coastal Fogbelt

This group consists of four map units. It makes up about 5 percent of the survey area. The soils in this group are near the Pacific Ocean, where summer and winter temperatures are moderated by coastal fog. The soils are used primarily for recreation, as woodland, for homesite development, and as wildlife habitat.

1. Duneland-Waldport-Heceta

This map unit is on active foredunes, on recently stabilized dunes, and in interdunal swales and depressions. Elevation ranges from 0 to 500 feet. Slopes are dominantly 0 to 60 percent. The mean annual precipitation is 70 to 80 inches, the mean annual air temperature is 51 to 53 degrees F, and the frost-free period is 180 to 240 days.

This unit makes up about 1 percent of the survey area. It is about 37 percent Duneland, 26 percent Waldport soils, and 16 percent Heceta soils. The remaining 21 percent is components of minor extent.

Duneland consists of shifting transverse, oblique, and parabolic sand dunes. The dunes are very deep and excessively drained.

Waldport soils formed on nearly level to very steep, stabilized dunes. These soils are very deep and excessively drained. Typically, the surface layer and substratum are fine sand.

Heceta soils formed in nearly level interdunal swales and depressions. These soils are very deep and poorly drained. Typically, the surface layer and substratum are fine sand.

Of minor extent in this unit are Netarts soils on gently sloping and moderately sloping stabilized dunes and areas of Beaches that are sandy and are along the ocean.

This unit is used for recreation, as wildlife habitat, and for homesite development. It is limited by a hazard of soil blowing and sandy textures. The Heceta soil is also limited by wetness.

Maintaining plant cover helps to prevent soil blowing. Irrigation is needed for lawn grasses and shrubs. On the Heceta soil, select plants that tolerate wetness. The steeper areas of this unit are not suited to homesite development.

2. Salander

This map unit is on side slopes and ridges. Elevation ranges from 50 to 800 feet. Slopes are dominantly 12 to 60 percent. The mean annual precipitation is 70 to 80 inches, the mean annual air temperature is 50 to 53 degrees F, and the frost-free period is 180 to 240 days.

This unit makes up about 1 percent of the survey area. It is about 67 percent Salander soils. The remaining 33 percent is water and soils of minor extent.

Salander soils formed on moderately sloping and steep side slopes. These soils are very deep and well drained. Typically, the surface layer and subsoil are silt loam.

Of minor extent are Tahkenitch Lake; Clevescove, Millicoma, and Reedsport soils on steep and very steep side slopes; and Bragton soils on nearly level flood plains adjacent to Tahkenitch Lake.

This unit is used as woodland. The soils are limited by plant competition, steepness of slope, and a hazard of erosion.

Plant competition can be overcome by intensive site preparation and maintenance. Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding.

3. Millicoma-Reedsport-Svensen

This map unit is on side slopes and narrow ridges. Elevation ranges from 50 to 1,500 feet. Slopes are dominantly 3 to 90 percent. The mean annual precipitation is 70 to 90 inches, the mean annual air temperature is 49 to 53 degrees F, and the frost-free period is 145 to 240 days.

This unit makes up about 2 percent of the survey area. It is about 42 percent Millicoma soils, 35 percent Reedsport soils, and 17 percent Svensen soils. The remaining 6 percent is components of minor extent.

Millicoma soils formed on steep and very steep side slopes. These soils are moderately deep and well drained. Typically, the surface layer is gravelly loam and the subsoil is very gravelly loam.

Reedsport soils formed on steep and very steep side slopes. These soils are moderately deep and well drained. Typically, the surface layer is gravelly loam and the subsoil is loam and clay loam.

Svensen soils formed on gently sloping to very steep side slopes. These soils are deep and well drained. Typically, the surface layer is loam and the subsoil is loam and clay loam.

Of minor extent in this unit are Salander soils on moderately sloping and steep side slopes, Rock outcrop on very steep side slopes, and Templeton soils on steep and very steep side slopes.

This unit is used as woodland. The soils are limited by steepness of slope, plant competition, and a hazard of erosion.

Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods. Plant competition can be overcome by intensive site preparation and maintenance. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding.

4. Coquille

This map unit is on low flood plains that are subject to tidal flooding or are protected by dikes. Elevation ranges from 0 to 10 feet. Slopes are dominantly 0 to 1 percent. The mean annual precipitation is 70 to 90 inches, the mean annual air temperature is 50 to 53 degrees F, and the frost-free period is 180 to 240 days.

This unit makes up about 1 percent of the survey area. It is about 75 percent Coquille soils. The remaining 25 percent is water and soils of minor extent.

Coquille soils formed on nearly level, low flood plains. These soils are very deep and very poorly drained. Typically, the surface layer is silt loam and the substratum is silt loam and silty clay loam.

Of minor extent in this unit are the Umpqua River; Lint soils on terraces; and Nestucca, Bragton, Willanch, and Yachats soils on flood plains.

This unit is used for hay and pasture and as wildlife habitat and wetland management. The soils are limited by hazards of flooding and compaction and by wetness.

Protection from flooding can be provided only by the use of extensive dikes. To reduce the risk of compaction, use planned grazing systems and proper stocking rates and limit grazing to drier periods. Select plants that tolerate wetness.

Soils of the Interior Valley Lowlands

This group consists of three map units. It makes up about 16 percent of the survey area. The soils in this group are at low elevations in the Umpqua Valley. They are used primarily for hay and pasture, as cropland, and for homesite development. A few areas are used as woodland.

5. Conser-Newberg-Roseburg

This map unit is on flood plains and terraces. Elevation ranges from 50 to 1,600 feet. Slopes are dominantly 0 to 3 percent. The mean annual precipitation is 30 to 60 inches, the mean annual air temperature is 50 to 55 degrees F, and the frost-free period is 180 to 235 days.

This unit makes up about 4 percent of the survey area. It is about 12 percent Conser soils, 9 percent Newberg soils, and 8 percent Roseburg soils. The remaining 71 percent is water and soils of minor extent.

Conser soils formed on nearly level terraces. These soils are very deep and poorly drained. Typically, the surface layer is silty clay loam and the subsoil and substratum are clay.

Newberg soils formed on nearly level, low flood plains. These soils are very deep and somewhat excessively drained. Typically, the surface layer is fine sandy loam and the substratum is fine sandy loam and loamy fine sand.

Roseburg soils formed on nearly level, high flood plains. These soils are very deep and well drained. Typically, the surface layer is loam and the subsoil is clay loam, loam, and sandy loam.

Of minor extent in this unit are water in the Umpqua River and other streams of the Umpqua watershed; Camas, Evans, Chapman, Chehalis, Glide, and Sibold soils on nearly level flood plains; Banning, Bashaw, Brand, Central Point, Coburg, Foehlin, Fordice, Malabon, Medford, and Natroy soils on nearly level terraces; Kirkendall and Nekoma soils on nearly level flood plains; and Meda soils on gently sloping and moderately sloping alluvial fans and terraces in areas that receive more than 60 inches of precipitation annually.

This unit is used for hay and pasture, as cropland, for homesite development, and as wetland management. All of the soils are limited by a hazard of compaction, the Newberg and Roseburg soils are limited by a hazard of flooding, and the Conser soils are limited by wetness and a high content of clay.

Reduce the risk of compaction by using planned grazing systems and proper stocking rates, returning crop residue to the soil, and limiting grazing and field operations to drier periods. On the Conser soils, select plants that tolerate wetness. Because of the high content of clay in the Conser soils, prevent structural damage as a result of shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings. The Conser soils generally are not suited to septic tank absorption fields. Houses and other structures should be located above the expected high water level.

6. Oakland-Sutherlin-Nonpareil

This map unit is on toeslopes, footslopes, side slopes, and ridges of hills underlain by sandstone and siltstone. Elevation ranges from 400 to 1,600 feet. Slopes are dominantly 3 to 60 percent. The mean annual precipitation is 30 to 55 inches, the mean annual air temperature is 50 to 55 degrees F, and the frost-free period is 160 to 235 days.

This unit makes up about 8 percent of the survey area. It is about 25 percent Oakland soils, 15 percent Sutherlin soils, and 12 percent Nonpareil soils. The remaining 48 percent is soils of minor extent.

Oakland soils formed on gently sloping to steep toeslopes, footslopes, side slopes, and ridges. These soils are moderately deep and well drained. Typically, the surface layer is silt loam and the subsoil is silty clay loam and silty clay.

Sutherlin soils formed on gently sloping and moderately sloping toeslopes and footslopes. These soils are very deep and moderately well drained. Typically, the surface layer is silt loam, the subsoil is silty clay loam, and the contrasting substratum is silty clay.

Nonpareil soils formed on gently sloping to steep toeslopes, footslopes, side slopes, and ridges. These soils are shallow and well drained. Typically, the surface layer and subsoil are loam.

Of minor extent in this unit are Speaker, Bateman, and Windygap silt loams on gently sloping to steep toeslopes, side slopes, and ridges; Pengra soils on gently sloping and moderately sloping toeslopes, footslopes, and alluvial fans; and Conser soils on nearly level terraces.

This unit is used for hay and pasture, as cropland, and for homesite development. It is also used as woodland. The soils are limited by hazards of erosion and compaction, steepness of slope, depth to bedrock, and depth to the clay layer.

Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Reduce the risks of compaction and erosion by using planned grazing systems and proper stocking rates, returning crop residue to the soil, and limiting grazing to drier periods.

In areas used as woodland, wheeled and tracked equipment can be used in the less sloping areas but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding.

If this unit is used for homesite development, sanitary facilities are limited by the depth to bedrock in the Oakland and Nonpareil soils and by the depth to the clay layer in the Sutherlin soils. Because of the high content of clay in the Sutherlin soils, structural damage as a result of shrinking and swelling can be prevented by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings. The steeper areas of this unit are not suited to homesite development.

7. Philomath-Dixonville-Curtin

This map unit is on toeslopes, footslopes, side slopes, ridges, and alluvial fans of hills underlain by basalt. Elevation ranges from 400 to 2,000 feet. Slopes are dominantly 3 to 60 percent. The mean annual precipitation is 30 to 55 inches, the mean annual air temperature is 50 to 55 degrees F, and the frost-free period is 160 to 235 days.

This unit makes up about 4 percent of the survey area. It is about 36 percent Philomath soils, 20 percent Dixonville soils, and 19 percent Curtin soils. The remaining 25 percent is soils of minor extent.

Philomath soils formed on gently sloping to steep footslopes, side slopes, and ridges. These soils are shallow and well drained. Typically, the surface layer is silty clay and clay.

Dixonville soils formed on gently sloping to steep toeslopes, footslopes, side slopes, and ridges. These soils are moderately deep and well drained. Typically, the surface layer is silty clay loam and the subsoil is silty clay and clay.

Curtin soils formed on gently sloping and moderately sloping alluvial fans and footslopes. These soils are very deep and somewhat poorly drained. Typically, the surface layer and subsoil are clay.

Of minor extent in this unit are Edenbower soils on gently sloping to steep side slopes and ridges; Ritner soils on moderately sloping to very steep footslopes, side slopes, and ridges; Climax soils on moderately sloping and steep footslopes and side slopes; and Philomath and Dixonville soils on very steep side slopes.

This unit is used for hay and pasture, as cropland, and for homesite development. The Dixonville soils are also used as woodland. The soils in this unit are limited by hazards of erosion and compaction, steepness of slope, wetness, depth to bedrock, and a high content of clay.

Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Reduce compaction and erosion by using planned grazing systems and proper stocking rates, returning crop residue to the soil, and limiting grazing to drier periods. On the Curtin soils, select plants that tolerate wetness.

If the Dixonville soils used as woodland, wheeled and tracked equipment can be used in the less sloping areas but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding.

If this unit is used for homesite development, sanitary facilities are limited by the depth to bedrock in the Philomath and Dixonville soils and by the high content of clay in the Curtin soils. Because of the high content of clay in the Curtin soils, structural damage as a result of shrinking and swelling can be prevented by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings. The Curtin soils generally are not suited to septic tank absorption fields. The steeper areas of this unit are not suited to homesite development.

Soils of the Interior Hills and Mountains

This group consists of three map units. It makes up about 15 percent of the survey area. The soils in this group are along the edge of the interior of the Umpqua Valley. They are dry during part of the growing season. The soils are used primarily as woodland. A few areas are used as pasture.

8. Bateman-Windygap-Atring

This map unit is on toeslopes, footslopes, side slopes, and broad ridges. The soils in this unit are dominantly clayey and are derived from sandstone and siltstone. Elevation ranges from 300 to 2,500 feet. Slopes are dominantly 12 to 60 percent. The mean annual precipitation is 40 to 55 inches, the mean annual air temperature is 50 to 55 degrees F, and the frost-free period is 160 to 235 days.

This unit makes up about 8 percent of the survey area. It is about 34 percent Bateman soils, 20 percent Windygap soils, and 9 percent Atring soils. The remaining 37 percent is soils of minor extent.

Bateman soils formed on moderately sloping and steep footslopes, side slopes, and broad ridges. These soils are very deep and well drained. Typically, the surface layer is silt loam and the subsoil is silty clay loam.

Windygap soils formed on moderately sloping and steep footslopes, side slopes, and broad ridges. These soils are deep and well drained. Typically, the surface layer is silt loam and the subsoil is silty clay.

Atring soils formed on steep side slopes and ridges. They are moderately deep and well drained. Typically, the surface layer is gravelly loam and the subsoil is very gravelly loam.

Of minor extent in this unit are Bellpine, Oakland,

and Rosehaven soils on gently sloping to steep toeslopes, footslopes, side slopes, and ridges; Sutherlin soils on gently sloping and moderately sloping toeslopes, footslopes, and alluvial fans; Bateman and Windygap soils on gently sloping toeslopes; and Atring soils on very steep side slopes.

This unit is used as woodland and for hay and pasture. It is also used as cropland and for homesite development. The soils are limited by hazards of erosion and compaction and by steepness of slope.

In areas used as woodland, reduce the risk of compaction by using suitable logging systems, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction. Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding.

In areas used for hay and pasture and as cropland, erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Reduce the risks of compaction and erosion by using planned grazing systems and proper stocking rates, returning crop residue to the soil, and limiting grazing and field operations to drier periods.

The steeper areas of this unit are not suited to homesite development.

9. Jory-Dixonville-Ritner

This map unit is on toeslopes, footslopes, side slopes, and broad ridges. The soils in this unit are dominantly clayey and are derived from basalt. Elevation ranges from 400 to 2,100 feet. Slopes are dominantly 3 to 60 percent. The mean annual precipitation is 40 to 55 inches, the mean annual air temperature is 50 to 55 degrees F, and the frost-free period is 160 to 225 days.

This unit makes up about 2 percent of the survey area. It is about 49 percent Jory soils, 13 percent Dixonville soils, and 9 percent Ritner soils. The remaining 29 percent is soils of minor extent.

Jory soils formed on gently sloping to steep toeslopes, footslopes, side slopes, and broad ridges. These soils are very deep and well drained. Typically, the surface layer is silty clay loam and the subsoil is silty clay.

Dixonville soils formed on gently sloping to steep toeslopes, footslopes, side slopes, and ridges. These soils are moderately deep and well drained. Typically, the surface layer is silty clay loam and the subsoil is silty clay and clay.

Ritner soils formed on moderately sloping and steep footslopes, side slopes, and ridges. These soils are moderately deep and well drained. Typically, the surface layer is gravelly silty clay loam and the subsoil is very gravelly silty clay and very cobbly silty clay.

Of minor extent in this unit are Darby soils on moderately sloping and steep footslopes and side slopes; Philomath soils on gently sloping to steep footslopes, side slopes, and ridges; Nekia soils on gently sloping to steep toeslopes, footslopes, side slopes, and ridges; Yoncalla soils on gently sloping and moderately sloping toeslopes, footslopes, and alluvial fans; Sahaptin soils on steep and very steep side slopes; and Jory and Ritner soils on very steep side slopes.

This unit is used as woodland and for hay and pasture. It is also used as cropland and for homesite development. The soils are limited by hazards of erosion and compaction and by steepness of slope.

In areas used as woodland, reduce the risk of compaction by using suitable logging systems, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction. Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding.

In areas used for hay and pasture and as cropland, erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Reduce the risks of compaction and erosion by using planned grazing systems and proper stocking rates, returning crop residue to the soil, and limiting grazing and field operations to drier periods.

The steeper areas of this unit are not suited to homesite development.

10. Atring-Rosehaven-Larmine

This map unit is on side slopes and narrow ridges. The soils in this unit are dominantly loamy and are derived from sandstone and siltstone. Elevation ranges from 300 to 2,500 feet. Slopes are dominantly 30 to 90 percent. The mean annual precipitation is 40 to 55 inches, the mean annual air temperature is 50 to 55 degrees F, and the frost-free period is 160 to 235 days.

This unit makes up about 5 percent of the survey area. It is about 29 percent Atring soils, 17 percent

Rosehaven soils, and 11 percent Larmine soils. The remaining 43 percent is components of minor extent.

Atring soils formed on steep and very steep side slopes. These soils are moderately deep and well drained. Typically, the surface layer is gravelly loam and the subsoil is very gravelly loam.

Rosehaven soils formed on steep side slopes. These soils are very deep and well drained. Typically, the surface layer is loam and the subsoil is clay loam.

Larmine soils formed on steep and very steep side slopes. These soils are shallow and well drained. Typically, the surface layer is gravelly loam and the subsoil is very gravelly loam and extremely gravelly loam.

Of minor extent in this unit are Bateman, Bellpine, and Windygap silt loams on moderately sloping and steep side slopes and ridges; Littlesand soils on very steep side slopes; Speaker soils on moderately sloping ridges and steep, south-facing side slopes; Rock outcrop on very steep side slopes; and Rosehaven soils on moderately sloping footslopes.

This unit is used as woodland. The soils are limited by steepness of slope and a hazard of erosion.

Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding.

Soils of the Klamath Mountains

This group consists of eight map units. It makes up about 29 percent of the survey area. The soils in this group are in the southern part of the survey area. They are dry during part of the growing season. The soils are used primarily as woodland and pasture and for homesite development.

11. Pengra-Buckeye-McMullin

This map unit is on alluvial fans, toeslopes, footslopes, side slopes, and ridges. The soils in this unit are underlain by metamorphic rock. Elevation ranges from 600 to 3,200 feet. Slopes are dominantly 3 to 60 percent. The mean annual precipitation is 35 to 45 inches, the mean annual air temperature is 50 to 55 degrees F, and the frost-free period is 160 to 220 days.

This unit makes up about 2 percent of the survey area. It is about 14 percent Pengra soils, 10 percent Buckeye soils, and 7 percent McMullin soils. The remaining 69 percent is soils of minor extent.

Pengra soils formed on gently sloping and moderately sloping toeslopes, footslopes, and alluvial fans. These soils are very deep and somewhat poorly drained. Typically, the surface layer is silt loam and the subsoil is silty clay loam and clay.

Buckeye soils formed on gently sloping to steep footslopes, side slopes, and ridges. These soils are moderately deep and well drained. Typically, the surface layer is loam and the subsoil is loam and gravelly clay loam.

McMullin soils formed on gently sloping to steep side slopes and ridges. These soils are shallow and well drained. Typically, the surface layer is loam and the subsoil is gravelly loam.

Of minor extent in this unit are Conser soils on nearly level terraces; Josephine soils on gently sloping and steep toeslopes, footslopes, and side slopes; Reston soils on gently sloping to very steep side slopes and ridges; Speaker soils on steep side slopes; Beekman and Vermisa soils on very steep side slopes; and McMullin soils on very steep side slopes.

This unit is used mainly as pasture. It is also used for hay and homesite development. The Buckeye soils are used as woodland. The soils in this unit are limited by the hazards of erosion and compaction, steepness of slope, depth to bedrock, depth to the clay layer, and wetness.

In areas used for hay and pasture, reduce the risks of compaction and erosion by using planned grazing systems and proper stocking rates, returning crop residue to the soil, and limiting grazing and field operations to drier periods. Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. On the Pengra soils, select plants that tolerate wetness.

If this unit is used for homesite development, sanitary facilities are limited by the depth to bedrock in the Buckeye and McMullin soils and by the depth to the clay layer and wetness of the Pengra soils. In the Pengra soils, structural damage as a result of shrinking and swelling can be prevented by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings. The steeper areas of this unit are not suited to homesite development.

If the Buckeye soils are used as woodland, wheeled and tracked equipment can be used in the less sloping areas but in the steeper areas cable yarding generally is safer and disturbs the soils less.

Logging should be restricted to drier periods. Severe seedling mortality on south- and west-facing slopes can be overcome by use of intensive site preparation and maintenance. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding.

12. Speaker-Josephine-Hilltish

This map unit is on footslopes, side slopes, and ridges. The soils in this unit are underlain by sedimentary rock. Elevation ranges from 700 to 2,900 feet. Slopes are dominantly 12 to 90 percent. The mean annual precipitation is 35 to 40 inches, the mean annual air temperature is 50 to 54 degrees F, and the frost-free period is 150 to 200 days.

This unit makes up about 3 percent of the survey area. It is about 24 percent Speaker soils, 16 percent Josephine soils, and 8 percent Hilltish soils. The remaining 52 percent is soils of minor extent.

Speaker soils formed on moderately sloping and steep footslopes, side slopes, and ridges. These soils are moderately deep and well drained. Typically, the surface layer is loam and the subsoil is loam and gravelly clay loam.

Josephine soils formed on moderately sloping and steep footslopes, side slopes, and ridges. These soils are deep and well drained. Typically, the surface layer is gravelly loam and the subsoil is gravelly loam and gravelly clay loam.

Hilltish soils formed on steep and very steep side slopes. These soils are moderately deep and well drained. Typically, the surface layer is very gravelly sandy loam, the subsoil is very gravelly sandy loam, and the substratum is extremely cobbly sandy loam.

Of minor extent in this unit are Beekman soils on very steep side slopes; Sutherlin and Veneta soils on gently sloping and moderately sloping footslopes; drier Debenger and Brader soils on gently sloping to steep, south-facing footslopes and side slopes; Eightlar soils on gently sloping and moderately sloping alluvial fans; and Speaker and Josephine soils on gently sloping toeslopes.

This unit is used mainly as woodland and for hay and pasture. It is also used for homesite development. The soils are limited by hazards of erosion and compaction, seedling mortality, steepness of slope, and depth to bedrock.

In areas used as woodland, reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding. Severe seedling mortality on south- and west-facing slopes can be overcome by use of intensive site preparation and maintenance. Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods.

In areas used for hay and pasture, reduce the risk of compaction by using planned grazing systems and proper stocking rates and by limiting grazing to drier periods.

If this unit is used for homesite development, sanitary facilities are limited by the depth to rock in the Speaker and Hilltish soils. The steeper areas of this unit are not suited to homesite development.

13. Lettia-Beal

This map unit is on footslopes, side slopes, and ridges. The soils in this unit are underlain by granitic rock. Elevation ranges from 700 to 3,500 feet. Slopes are dominantly 3 to 60 percent. The mean annual precipitation is 35 to 60 inches, the mean annual air temperature is 45 to 53 degrees F, and the frost-free period is 100 to 200 days.

The unit makes up about 4 percent of the survey area. It is about 47 percent Lettia soils and 8 percent Beal soils. The remaining 45 percent is soils of minor extent.

Lettia soils formed on gently sloping to steep footslopes, side slopes, and ridges. These soils are deep and well drained. Typically, the surface layer is gravelly loam and the subsoil is loam and clay loam.

Beal soils formed on moderately sloping and steep footslopes and side slopes. These soils are very deep and moderately well drained. Typically, the surface layer is loam and the subsoil is clay loam and clay.

Of minor extent in this unit are the drier Wolfpeak, Greengulch, and Cedargrove soils on gently sloping to steep footslopes, side slopes, and ridges; Zing soils on gently sloping to steep footslopes and side slopes; Steinmetz and Sitkum soils on very steep side slopes; and the moister Buckshot and Stinger soils on very steep, north-facing side slopes.

This unit is used as woodland and for hay and pasture. The soils are limited by hazards of erosion and compaction, plant competition, seedling mortality, and steepness of slope.

In areas used as woodland, reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding. Plant competition and severe seedling mortality on the south- and west-facing slopes can be overcome by use of intensive site preparation and maintenance. Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods.

In areas used for hay and pasture, reduce the risk of compaction by using planned grazing systems and proper stocking rates and by limiting grazing to drier periods.

14. Windygap-Chimneyrock

This map unit is on footslopes, side slopes, and broad ridges. The soils in this unit are underlain by sedimentary rock. Elevation ranges from 400 to 3,400 feet. Slopes are 12 to 90 percent. The mean annual precipitation is 40 to 55 inches, the mean annual air temperature is 50 to 55 degrees F, and the frost-free period is 120 to 200 days.

This unit makes up about 4 percent of the survey area. It is about 41 percent Windygap soils and 9 percent Chimneyrock soils. The remaining 50 percent is soils of minor extent.

Windygap soils formed on moderately sloping and steep footslopes, side slopes, and broad ridges. These soils are deep and well drained. Typically, the surface layer is clay loam and the subsoil is clay and silty clay.

Chimneyrock soils formed on steep and very steep side slopes. These soils are deep and well drained. Typically, the surface layer is very gravelly loam and the subsoil is gravelly clay loam and extremely cobbly clay loam.

Of minor extent in this unit are Bellpine soils on gently sloping to steep footslopes, side slopes, and ridges; Speaker soils on steep side slopes; Atring soils on very steep side slopes; Dicecreek soils on steep, south-facing side slopes; Vermisa soils on very steep, south-facing side slopes; McNab soils in nearly level and gently sloping swales; Kanid soils on very steep, north-facing side slopes; and Windygap soils on gently sloping toeslopes.

This unit is used mainly as woodland. It is also used for hay and pasture. The soils are limited by seedling mortality, steepness of slope, and hazards of erosion and compaction.

In areas used as woodland, severe seedling mortality on south- and west-facing slopes can be overcome by use of intensive site preparation and maintenance. Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding.

In areas used for hay and pasture, reduce the risk of compaction by using planned grazing systems and proper stocking rates and by limiting grazing to drier periods.

15. Gravecreek-Dubakella-Pearsoll

This map unit is on side slopes and ridges. The soils in this unit are underlain by serpentinitic rock. Elevation ranges from 800 to 4,500 feet. Slopes are dominantly 12 to 80 percent. The mean annual precipitation is 35 to 60 inches, the mean annual air temperature is 45 to 52 degrees F, and the frost-free period is 100 to 180 days.

The unit makes up about 1 percent of the survey area. It is about 37 percent Gravecreek soils, 28 percent Dubakella soils, and 23 percent Pearsoll soils. The remaining 12 percent is soils of minor extent.

Gravecreek soils formed on moderately sloping to very steep side slopes and ridges. These soils are moderately deep and well drained. Typically, the surface layer is gravelly loam and the subsoil is very gravelly clay loam.

Dubakella soils formed on steep and very steep side slopes. These soils are moderately deep and well drained. Typically, the surface layer is very stony clay loam and the subsoil is very cobbly clay.

Pearsoll soils formed on steep and very steep side slopes. These soils are shallow and well drained. Typically, the surface layer is extremely stony clay loam and the subsoil is extremely cobbly clay.

Of minor extent in this unit are Josephine and Speaker soils on steep side slopes; Vermisa and Beekman soils on very steep side slopes; Windygap soils on moderately sloping, broad ridges; Acker and Norling soils on steep side slopes; Kanid soils on very steep side slopes; and Dubakella and Pearsoll soils on gently sloping and moderately sloping side slopes and ridges.

This unit is used mainly as woodland. It is also used as pasture. The soils are limited by a hazard of erosion, seedling mortality, steepness of slope, and a high amount of rock fragments on the surface and in the soils.

In areas used as woodland, reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding. Severe seedling mortality on south- and west-facing slopes can be overcome by use of intensive site preparation and maintenance. Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods.

In areas used as pasture, reduce the risk of compaction by using planned grazing systems and proper stocking rates and by limiting grazing to drier periods.

16. Josephine-Acker-Beekman

This map unit is on side slopes. The soils in this unit are underlain by metamorphic rock. Elevation ranges from 600 to 4,000 feet. Slopes are dominantly 30 to 90 percent. The mean annual precipitation is 35 to 50 inches, the mean annual air temperature is 45 to 52 degrees F, and the frost-free period is 100 to 200 days.

This unit makes up about 8 percent of the survey area. It is about 17 percent Josephine soils, 14 percent Acker soils, and 11 percent Beekman soils. The remaining 58 percent is soils of minor extent.

Josephine soils formed on steep, south-facing side slopes. These soils are deep and well drained. Typically, the surface layer is gravelly loam and the subsoil is gravelly loam and gravelly clay loam.

Acker soils formed on steep, north-facing side slopes. These soils are very deep and well drained. Typically, the surface layer is gravelly loam and the subsoil is clay loam.

Beekman soils formed on very steep, south-facing side slopes. These soils are moderately deep and well drained. Typically, the surface layer is gravelly loam and the subsoil is very gravelly loam and very gravelly clay loam.

Of minor extent in this unit are Kanid and Atring soils on very steep, north-facing side slopes; Speaker soils on steep, south-facing side slopes; Norling soils on steep, north-facing side slopes; Vermisa soils on very steep side slopes; Dumont and Pollard soils on gently sloping and moderately sloping footslopes and ridges; and Acker and Josephine soils on moderately sloping footslopes and ridges.

This unit is used as woodland. The soils are limited by steepness of slope, a hazard of erosion, and seedling mortality.

Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding. Severe seedling mortality on south- and west-facing slopes can be overcome by use of intensive site preparation and maintenance.

17. Acker-Kanid-Atring

This map unit is on side slopes. The soils in this unit are underlain by metamorphic rock. Elevation ranges from 1,000 to 4,000 feet. Slopes are dominantly 30 to 90 percent. The mean annual precipitation is 40 to 60 inches, the mean annual air temperature is 45 to 52 degrees F, and the frost-free period is 100 to 200 days.

This unit makes up about 5 percent of the survey area. It is about 23 percent Acker soils, 23 percent Kanid soils, and 22 percent Atring soils. The remaining 32 percent is soils of minor extent.

Acker soils formed on steep side slopes. These soils are very deep and well drained. Typically, the surface layer is gravelly loam and the subsoil is clay loam.

Kanid soils formed on very steep side slopes. These soils are deep and well drained. Typically, the surface layer is very gravelly loam and the subsoil is very gravelly clay loam.

Atring soils formed on very steep side slopes. These soils are moderately deep and well drained. Typically, the surface layer and subsoil are very gravelly loam.

Of minor extent in this unit are Norling soils on steep side slopes; Vermisa soils on very steep side slopes; Dumont soils on gently sloping and moderately sloping toeslopes and ridges; Lettia soils that are derived from granodiorite and are on gently sloping to steep footslopes, side slopes, and ridges; Acker soils on gently sloping footslopes; colder Pyrady and Zalea soils on moderately sloping ridges at high elevations on Anaktuvuk Saddle; and Jayar soils on steep and very steep side slopes of King and Cedar Springs Mountains.

This unit is used as woodland. The soils are limited by steepness of slope, a hazard of erosion, seedling mortality, and a high amount of rock fragments on the surface and in the soils.

Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding. Severe seedling mortality on south- and west-facing slopes can be overcome by use of intensive site preparation and maintenance.

18. Sharpshooter-Lettia

This map unit is on side slopes and ridges. The soils in this unit are underlain by granitic rock and schist. Elevation ranges from 900 to 3,900 feet. Slopes are dominantly 30 to 90 percent. The mean annual precipitation is 40 to 60 inches, the mean annual air temperature is 45 to 52 degrees F, and the frost-free period is 100 to 180 days.

The unit makes up about 2 percent of the survey area. It is about 43 percent Sharpshooter soils and 13 percent Lettia soils. The remaining 44 percent is soils of minor extent.

Sharpshooter soils formed on steep and very steep side slopes. These soils are deep and well drained. Typically, the surface layer is loam and the subsoil is loam and gravelly loam.

Lettia soils formed on steep side slopes. These soils are deep and well drained. Typically, the surface layer is gravelly loam and the subsoil is loam and clay loam.

Of minor extent in this unit are Steinmetz and Sitkum soils on very steep side slopes, Beal and Zing soils on gently sloping to steep footslopes and side slopes, and Lettia and Sharpshooter soils on gently sloping and moderately sloping side slopes and ridges.

This unit is used as woodland. The soils are limited by a hazard of erosion, seedling mortality, and steepness of slope.

Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding. Severe seedling mortality on the south- and west-facing slopes can be overcome by use of intensive site preparation and maintenance. Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods.

Soils of the Coast Range Mountains

This group consists of four map units. It makes up about 25 percent of the survey area. The soils in this group are in the western to northwestern part of the survey area. They are moist most of the growing season. The soils are used primarily as woodland.

19. Absaquil-McDuff-Preacher

This map unit is on side slopes and broad ridges. The soils in this unit are dominantly clayey and warm (mesic). Elevation ranges from 300 to 3,000 feet. Slopes are dominantly 3 to 60 percent. The mean annual precipitation is 55 to 90 inches, the mean annual air temperature is 45 to 53 degrees F, and the frost-free period is 145 to 240 days.

This unit makes up about 4 percent of the survey area. It is about 17 percent Absaquil soils, 15 percent McDuff soils, and 13 percent Preacher soils. The remaining 55 percent is soils of minor extent.

Absaquil soils formed on gently sloping to steep side slopes and broad ridges. These soils are deep and well drained. Typically, the surface layer is silt loam and the subsoil is silty clay loam, silty clay, and gravelly silty clay.

McDuff soils formed on gently sloping to steep side slopes and broad ridges. These soils are moderately deep and well drained. Typically, the surface layer is silty clay loam and the subsoil is clay.

Preacher soils formed on gently sloping to steep side slopes and ridges. These soils are very deep and well drained. Typically, the surface layer is loam, the subsoil is loam and clay loam, and the substratum is clay loam.

Of minor extent in this unit are Bohannon soils on steep and very steep side slopes and ridges; Blachly, Honeygrove, Orford, and Xanadu soils on gently sloping to steep side slopes and broad ridges; and Digger, Umpcoos, and Preacher soils on very steep side slopes.

This unit is used as woodland. The soils are limited by plant competition, hazards of compaction and erosion, and steepness of slope.

Plant competition can be overcome by use of intensive site preparation and maintenance. Reduce the risk of compaction by using suitable logging systems, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding. Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods.

20. Preacher-Bohannon-Digger

This map unit is on moderately sloping and steep side slopes and ridges. The soils in this unit are dominantly loamy and warm (mesic). Elevation ranges from 200 to 3,100 feet. Slopes are dominantly 12 to 60 percent. The mean annual precipitation is 55 to 100 inches, the mean annual air temperature is 45 to 53 degrees F, and the frost-free period is 145 to 240 days.

This unit makes up about 4 percent of the survey area. It is about 24 percent Preacher soils, 21 percent Bohannon soils, and 9 percent Digger soils. The remaining 46 percent is soils of minor extent.

Preacher soils formed on moderately sloping and steep side slopes. These soils are very deep and well drained. Typically, the surface layer is loam, the subsoil is loam and clay loam, and the substratum is clay loam.

Bohannon soils formed on moderately sloping and steep side slopes and ridges. These soils are moderately deep and well drained. Typically, the surface layer and subsoil are gravelly loam.

Digger soils formed on moderately sloping and steep side slopes and ridges. These soils are moderately deep and well drained. Typically, the surface layer and subsoil are very gravelly loam.

Of minor extent in this unit are Absaquil and Orford soils on gently sloping to steep side slopes and broad ridges; Damewood soils on very steep side slopes; Blachly, McDuff, and Xanadu soils on gently sloping to steep side slopes and broad ridges; Umpcoos soils on very steep side slopes; Digger and Bohannon soils on very steep side slopes; Preacher soils on gently sloping ridges; Kirkendall and Nekoma soils on flood plains; and Meda soils on alluvial fans and terraces.

This unit is used as woodland. The soils are limited by plant competition, steepness of slope, and a hazard of erosion.

Plant competition can be overcome by use of intensive site preparation and maintenance. Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding.

21. Bohannon-Umpcoos-Damewood

This map unit is on steep and very steep side slopes and headwalls. The soils in this unit are dominantly loamy and warm (mesic). Elevation ranges from 200 to 3,600 feet. Slopes are dominantly 30 to 90 percent. The mean annual precipitation is 55 to 110 inches, the mean annual air temperature is 45 to 53 degrees F, and the frost-free period is 145 to 240 days.

This unit makes up about 16 percent of the survey area. It is about 22 percent Bohannon soils, 22 percent Umpcoos soils, and 18 percent Damewood soils. The remaining 38 percent is components of minor extent.

Bohannon soils formed on steep and very steep side slopes. These soils are moderately deep and well drained. Typically, the surface layer and subsoil are gravelly loam.

Umpcoos soils formed on steep and very steep side slopes and headwalls. These soils are shallow and well drained. Typically, the surface layer and subsoil are very gravelly sandy loam.

Damewood soils formed on steep and very steep side slopes. These soils are moderately deep and well drained. Typically, the surface layer is very gravelly loam and the subsoil is extremely gravelly loam.

Of minor extent in this unit are Digger soils on steep and very steep side slopes, Preacher soils on gently sloping to very steep side slopes, Rock outcrop on very steep side slopes, Blachly soils on gently sloping to steep side slopes and broad ridges, Bohannon soils on gently sloping and moderately sloping ridges, Kirkendall and Nekoma soils on flood plains, and Meda soils on alluvial fans and terraces.

This unit is used as woodland. The soils are limited by steepness of slope, a hazard of erosion, plant competition, and depth to bedrock.

Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding. Plant competition can be overcome by use of intensive site preparation and maintenance.

22. Laderly-Leopold-Romanose

This map unit is on side slopes and broad ridges. The soils in this unit are loamy and cold (frigid). Elevation ranges from 1,500 to 2,850 feet. Slopes are dominantly 3 to 90 percent. The mean annual precipitation is 90 to 120 inches, the mean annual air temperature is 42 to 45 degrees F, and the frost-free period is 100 to 145 days.

This unit makes up about 1 percent of the survey area. It is about 59 percent Laderly soils, 23 percent Leopold soils, and 15 percent Romanose soils. The remaining 3 percent is components of minor extent.

Laderly soils formed on steep and very steep side slopes. These soils are moderately deep and well drained. Typically, the surface layer is very gravelly loam and the subsoil is extremely cobbly loam.

Leopold soils formed on gently sloping to steep side slopes and broad ridges. These soils are moderately deep and well drained. Typically, the surface layer is clay loam and the subsoil is gravelly silty clay loam and very gravelly silty clay loam.

Romanose soils formed on very steep side slopes.

These soils are shallow and well drained. Typically, the surface layer is very gravelly sandy loam and the substratum is extremely cobbly sandy loam.

Of minor extent in this unit are Bigdutch, Jayar, Pyrady, Stackyards, and Zalea soils; warmer Preacher and Bohannon soils at lower elevations on steep side slopes; Rock outcrop on very steep side slopes; warmer Hemcross and Klistan soils on gently sloping to steep side slopes and broad ridges; and Kilchis and Harslow soils on very steep side slopes.

This unit is used as woodland. The soils are limited by steepness of slope, a hazard of erosion, plant competition, and depth to rock.

Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding. Plant competition can be overcome by use of intensive site preparation and maintenance.

Soils of the Western Cascade Mountains

This group consists of three map units. It makes up about 10 percent of the survey area. The soils in this group are in the eastern part of the survey area. They are moist most of the growing season. The soils are used as woodland.

23. Orford-Honeygrove-Gustin

This map unit is on footslopes, side slopes, and broad ridges. The soils in this unit are clayey and warm (mesic). Elevation ranges from 800 to 3,500 feet. Slopes are dominantly 3 to 60 percent. The mean annual precipitation is 55 to 75 inches, the mean annual air temperature is 45 to 50 degrees F, and the frost-free period is 100 to 160 days.

This unit makes up about 5 percent of the survey area. It is about 40 percent Orford soils, 23 percent Honeygrove soils, and 15 percent Gustin soils. The remaining 22 percent is soils of minor extent.

Orford soils formed on gently sloping to steep side slopes and ridges. These soils are very deep and well drained. Typically, the surface layer is gravelly loam and the subsoil is silty clay loam.

Honeygrove soils formed on gently sloping to steep side slopes and broad ridges. These soils are very deep and well drained. Typically, the surface layer is gravelly clay loam and the subsoil is clay.

Gustin soils formed on gently sloping to steep footslopes and side slopes. These soils are very deep and somewhat poorly drained. Typically, the surface layer is clay loam and the subsoil is clay.

Of minor extent in this unit are Klickitat and Harrington soils on steep and very steep side slopes, Kinney soils on steep side slopes, and Shivigny soils on steep and very steep side slopes.

This unit is used as woodland. The soils are limited by plant competition, the hazards of compaction and erosion, and steepness of slope.

Plant competition can be overcome by use of intensive site preparation and maintenance. Reduce the risk of compaction by using suitable logging systems, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding. Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods.

24. Klickitat-Harrington-Kinney

This map unit is on side slopes. The soils in this unit are loamy and warm (mesic). Elevation ranges from 1,100 to 4,000 feet. Slopes are dominantly 30 to 90 percent. The mean annual precipitation is 55 to 75 inches, the mean annual air temperature is 45 to 50 degrees F, and the frost free period is 100 to 160 days.

This unit makes up about 3 percent of the survey area. It is about 50 percent Klickitat soils, 24 percent Harrington soils, and 12 percent Kinney soils. The remaining 14 percent is components of minor extent.

Klickitat soils formed on steep and very steep side slopes. These soils are very deep and well drained. Typically, the surface layer is extremely gravelly loam and the subsoil is very gravelly loam.

Harrington soils formed on very steep side slopes. These soils are moderately deep and well drained. Typically, the surface layer is very gravelly loam and the subsoil is very gravelly clay loam and extremely gravelly loam.

Kinney soils formed on steep side slopes. These soils are very deep and well drained. Typically, the surface layer is gravelly loam and the subsoil is clay loam and gravelly clay loam.

Of minor extent in this unit are cooler Illahee and Scaredman soils on steep and very steep, north-facing side slopes; Mellowmoon soils on steep, north-facing side slopes; Rock outcrop on very steep side slopes; Orford and Honeygrove soils on gently sloping to steep side slopes and ridges; and Klickitat and

Kinney soils on gently sloping and moderately sloping ridges.

This unit is used as woodland. The soils are limited by steepness of slope, a hazard of erosion, and plant competition.

Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding. Plant competition can be overcome by use of intensive site preparation and maintenance.

25. Illahee-Mellowmoon-Scaredman

This map unit is on side slopes and ridges. The soils in this unit are loamy and cold (frigid or cryic). Elevation ranges from 2,800 to 4,600 feet. Slopes are dominantly 3 to 90 percent. The mean annual precipitation is 60 to 80 inches, the mean annual air temperature is 40 to 45 degrees F, and the frost-free period is 50 to 100 days.

This unit makes up about 2 percent of the survey area. It is about 38 percent Illahee soils, 20 percent Mellowmoon soils, and 14 percent Scaredman soils. The remaining 28 percent is components of minor extent.

Illahee soils formed on gently sloping to very steep side slopes and ridges. These soils are very deep and well drained. Typically, the surface layer and subsoil are very gravelly loam.

Mellowmoon soils formed on gently sloping to steep side slopes and ridges. These soils are very deep and well drained. Typically, the surface layer is gravelly loam, the subsoil is clay loam and gravelly clay loam, and the substratum is gravelly loam.

Scaredman soils formed on steep and very steep side slopes. These soils are moderately deep and well drained. Typically, the surface layer is extremely gravelly loam and the subsoil is very gravelly loam.

Of minor extent in this unit are warmer Klickitat soils on steep and very steep, south-facing side slopes; Kinney soils on steep, south-facing side slopes; colder Oneonta and Keel soils on gently sloping to steep side slopes and broad ridges; colder Hummington soils on steep and very steep side slopes at high elevations on Huckleberry Mountain; Lempira and Limpy soils on gently sloping to steep side slopes and ridges; and Thistleburn and Telemon soils and Rock outcrop on very steep side slopes.

This unit is used as woodland. The soils are limited by steepness of slope and a hazard of erosion.

Wheeled and tracked equipment can be used in the less sloping areas, but in the steeper areas cable yarding generally is safer and disturbs the soils less. Logging should be restricted to drier periods. Reduce the risk of erosion around skid trails, logging roads, and cuts and fills by use of proper design, ripping, and seeding.

Broad Land Use Considerations

This section relates the major land uses in the survey area to the general soil map units. The land uses include woodland, hay and pasture, livestock grazing, cropland, wetland management, and homesite and urban development. These uses are grouped into three broad categories—woodland, woodland and pasture, and cropland and pasture (fig. 5).

About 89 percent of the survey area is woodland. It is on uplands in units 2, 3, and 6 through 25. The potential productivity of Douglas fir, the dominant tree species, and other species is highly variable. The highest productivity for Douglas fir is in units 19 and 23. Productivity on most of the units is good; however, units 6, 7, 11, 12, and 15 have the lowest potential productivity. All of the units that support woodland are limited by steepness of slope and a hazard of erosion. The production of timber on units 22 and 25 is limited by cold temperatures. Units 2, 3, 13, and 19 through 24 are limited by a hazard of plant competition. Units 8, 9, 19, and 23 are limited by a hazard of compaction. Units 11 through 18 are limited by a hazard of seedling mortality.

About 9 percent of the survey area is used for hay and pasture. These areas have been improved and seeded to grasses or grass-legume mixtures that are suited to the climate. They are on flood plains, terraces, footslopes, and hillsides in units 4 through 9 and 11 through 14. They are limited by a hazard of compaction. The most productive areas of hay and pasture are on the Roseburg soils in unit 5. These areas are limited by flooding. Units 6 through 9 and 11 through 13 are limited by a hazard of erosion and by steepness of slope. The Conser, Curtin, and Pengra soils in units 5, 7, and 11 are limited by a high content of clay or depth to a clay layer.

Areas used for livestock grazing make up a small percentage of the survey area. These areas support native grasses and forbs with scattered Oregon white oak. They are on the Nonpareil, Philomath, McMullin, Dubakella, and Pearsoll soils on hillsides and mountainsides in units 6, 7, 11, and 15. The soils are limited by a hazard of erosion, depth to rock, and steepness of slope. They are too shallow or too

Figure 5.—Broad categories of the major land uses in the survey area.

steep to plow or seed without increasing the risk of erosion.

About 2 percent of the survey area is used as cropland. Crops include many truck crops, small grain, and wine grapes. Some areas are used as fruit and nut orchards. The areas of cropland are on flood plains, terraces, footslopes, and ridges in units 5 through 9 and 11. The most productive cropland in the survey area is in unit 5; however, parts of this unit are limited by flooding and the Conser soils in this unit are limited by a high content of clay and wetness. The productivity of units 6 through 9 and 11 generally is good, but the soils are limited by a hazard of erosion and steepness of slope. Parts of units 6, 7, and 11 are limited by depth to a clay layer or a high content of clay, which results in wetness of the soils, and by depth to bedrock.

Wetland wildlife habitat makes up a small percentage of the survey area. It is in areas of poorly drained and very poorly drained soils on flood plains, terraces, and interdunal depressions in units 1 and 4.

Areas used as homesite and urban development are mainly in the central part of the survey area, along U.S. Interstate 5, and adjacent to the coast, along U.S. Highway 101. Some development has also taken place in rural areas. Units 1, 5 through 9, 11, and 12 are suited to homesite development. Unit 1 is limited by a hazard of soil blowing and sandy soil textures, and the Heceta soils in this unit are limited by wetness. Parts of unit 5 are limited by a hazard of flooding, and the Conser soils in this unit are limited by a high content of clay and wetness. Parts of units 6, 7, and 11 are limited by steepness of slope, depth to a clay layer or to bedrock, and a high content of clay. Units 8 and 9 are limited by steepness of slope. A high content of clay, depth to a clay layer, and wetness result in shrinking and swelling, which can damage structures. Areas that are subject to shrinking and swelling are poorly suited to sanitary facilities.

The young, stable sand dunes in unit 1 are used for recreational development. They are along U.S. Highway 101. They are limited by a hazard of soil blowing, sandy soil textures, and wetness. The uplands throughout the survey area are used for recreational activities such as hunting, fishing, camping, and hiking. They are limited for major recreational development by steepness of slope and restricted access.

Detailed Soil Map Units

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some “included” areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Jory silty clay loam, 2 to 12 percent slopes, is a phase of the Jory series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Josephine-Speaker complex, 30 to 60 percent north slopes, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

1C—Abegg very gravelly sandy loam, 2 to 12 percent slopes

Composition

Abegg soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: High terraces and alluvial fans
Parent material: Mixed alluvium
Elevation: 800 to 1,600 feet
Native plants: Douglas fir and Pacific madrone with an understory of cascade Oregongrape, common snowberry, creambush oceanspray, and western fescue
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 54 degrees F
Frost-free period—140 to 210 days

Typical Profile

0 to 4 inches—dark brown very gravelly sandy loam
4 to 9 inches—dark brown very gravelly loam
9 to 21 inches—dark yellowish brown extremely gravelly loam
21 to 35 inches—yellowish brown extremely cobbly clay loam
35 to 63 inches—yellowish brown extremely cobbly sandy loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5 inches

Contrasting Inclusions

- Acker, Foehlin, Josephine, and Rosehaven soils
- Packard soils on flood plains
- Dupee and Zing soils in concave positions and near drainageways
- Abegg soils that have slopes of more than 12 percent

Major Uses

Hay and pasture, woodland, and homesite development

Major Management Limitations

- High amount of rock fragments on the surface and in the soil
- Hazard of erosion
- Plant competition
- Seedling mortality
- Droughtiness

Use and Management

Hay and pasture

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Applications of irrigation water should be light and frequent.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

- Use conventional equipment in harvesting, but limit its use when the soil is wet.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

• Leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• For best results in landscaping, remove gravel and cobbles in disturbed areas.
• In many areas, it may be necessary to haul in topsoil for lawns and gardens.
• Seed cuts and fills to permanent vegetation.
• Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.

1D—Abegg very gravelly sandy loam, 12 to 20 percent slopes

Composition

Abegg soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Alluvial fans
Parent material: Mixed alluvium
Elevation: 800 to 1,600 feet
Native plants: Douglas fir and Pacific madrone with an understory of cascade Oregongrape, common snowberry, creambush oceanspray, and western fescue
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 54 degrees F
Frost-free period—140 to 210 days

Typical Profile

0 to 4 inches—dark brown very gravelly sandy loam
4 to 9 inches—dark brown very gravelly loam
9 to 21 inches—dark yellowish brown extremely gravelly loam
21 to 35 inches—yellowish brown extremely cobbly clay loam
35 to 63 inches—yellowish brown extremely cobbly sandy loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5 inches

Contrasting Inclusions

• Acker, Josephine, and Rosehaven soils
• Foehlin soils in less sloping positions
• Dupee and Zing soils in concave positions and near drainageways
• Abegg soils that have slopes of less than 12 percent or more than 20 percent

Major Uses

Hay and pasture, woodland, and homesite development

Major Management Limitations

• Hazard of erosion
• High amount of rock fragments on the surface and in the soil
• Steepness of slope
• Plant competition
• Seedling mortality
• Droughtiness

Use and Management

Hay and pasture

• Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Applications of irrigation water should be light and frequent.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to control runoff and erosion.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Reduce erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Tillage and seeding should be done on the contour or across the slope where practical.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

• Use conventional equipment in harvesting, but limit its use when the soil is wet.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.

• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• For best results in landscaping, remove gravel and cobbles in disturbed areas.
• In many areas, it may be necessary to haul in topsoil for lawns and gardens.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.
• Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.

1E—Abegg very gravelly sandy loam, 20 to 30 percent slopes

Composition

Abegg soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Alluvial fans
Parent material: Mixed alluvium
Elevation: 800 to 1,600 feet
Native plants: Douglas fir and Pacific madrone with an understory of cascade Oregongrape, common snowberry, creambush oceanspray, and western fescue
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 210 days

Typical Profile

0 to 4 inches—dark brown very gravelly sandy loam
4 to 9 inches—dark brown very gravelly loam
9 to 21 inches—dark yellowish brown extremely gravelly loam
21 to 35 inches—yellowish brown extremely cobbly clay loam
35 to 63 inches—yellowish brown extremely cobbly sandy loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5 inches

Contrasting Inclusions

• Norling and Speaker soils in convex, more steeply sloping positions
• Acker, Josephine, and Rosehaven soils
• Dupee and Zing soils in concave positions and near drainageways
• Abegg soils that have slopes of less than 20 percent

Major Uses

Hay and pasture, woodland, and homesite development

Major Management Limitations

• Hazard of erosion
• Steepness of slope
• High amount of rock fragments on the surface and in the soil
• Plant competition
• Seedling mortality
• Droughtiness

Use and Management

Hay and pasture

• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Reduce erosion by planning grazing systems, using

proper stocking rates, and limiting grazing and field operations to drier periods.
• Tillage and seeding should be done on the contour or across the slope where practical.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• For best results in landscaping, remove gravel and cobbles in disturbed areas.
• In many areas, it may be necessary to haul in topsoil for lawns and gardens.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.
• Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.

2E—Absaquil-Blachly-McDuff complex, 3 to 30 percent slopes

Composition

Absaquil soil and similar inclusions—40 percent
Blachly soil and similar inclusions—25 percent
McDuff soil and similar inclusions—20 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Broad ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—60 to 90 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Absaquil Soil

Typical profile

0 to 10 inches—dark brown and dark yellowish brown silt loam
10 to 26 inches—brown and strong brown silty clay loam
26 to 32 inches—strong brown silty clay
32 to 45 inches—strong brown gravelly silty clay
45 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Blachly Soil

Typical profile

0 to 10 inches—dark reddish brown silty clay loam
10 to 21 inches—dark red clay
21 to 60 inches—red clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 7.5 inches

McDuff Soil

Typical profile

0 to 10 inches—dark brown silty clay loam
10 to 32 inches—strong brown and dark yellowish brown clay
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4 inches

Contrasting Inclusions

- Preacher soils
- Bohannon soils in convex, more steeply sloping positions
- Soils that are similar to the Blachly soil but are poorly drained and are in concave positions and near drainageways
- McDuff, Absaquil, and Blachly soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Absaquil, Blachly, and McDuff

- Hazards of compaction and erosion
- Plant competition
- Steepness of slope
- Moderately slow permeability
- Low soil strength

McDuff

- Depth to rock
- Hazard of windthrow

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the McDuff soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

3E—Absaquil-Honeygrove-McDuff complex, 3 to 30 percent slopes

Composition

Absaquil soil and similar inclusions—40 percent
Honeygrove soil and similar inclusions—25 percent
McDuff soil and similar inclusions—20 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Broad ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 80 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Absaquil Soil

Typical profile

0 to 10 inches—dark brown and dark yellowish brown silt loam
10 to 26 inches—brown and strong brown silty clay loam
26 to 32 inches—strong brown silty clay
32 to 45 inches—strong brown gravelly silty clay
45 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Honeygrove Soil

Typical profile

0 to 12 inches—dark reddish brown gravelly clay loam
12 to 30 inches—dark reddish brown clay
30 to 63 inches—dark red clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 7.5 inches

McDuff Soil

Typical profile

0 to 10 inches—dark brown silty clay loam
10 to 32 inches—strong brown and dark yellowish brown clay
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4 inches

Contrasting Inclusions

- Preacher soils
- Bohannon soils in convex, more steeply sloping positions
- Soils that are similar to the Honeygrove soil but are poorly drained and are in concave positions and near drainageways
- McDuff, Absaquil, and Honeygrove soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Absaquil, Honeygrove, and McDuff

- Hazards of compaction and erosion
- Plant competition
- Steepness of slope
- Moderately slow permeability
- Low soil strength

McDuff

- Depth to rock
- Hazard of windthrow

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the McDuff soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

4E—Acker gravelly loam, 12 to 30 percent slopes

Composition

Acker soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Footslopes
Parent material: Colluvium and residuum derived from metamorphic rock
Elevation: 1,000 to 4,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, cascade Oregongrape, and western swordfern
Climatic factors:
Mean annual precipitation—40 to 60 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Typical Profile

0 to 5 inches—dark brown gravelly loam

5 to 19 inches—dark brown and strong brown clay loam
19 to 60 inches—strong brown clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Contrasting Inclusions

- Dumont soils
- McGinnis, Norling, and Tishar soils in convex, more steeply sloping positions
- Dubakella and Pearsoll soils underlain by serpentinite and peridotite
- Abegg soils on alluvial fans
- Zing soils in concave positions and near drainageways
- Acker soils that have slopes of less than 12 percent or more than 30 percent

Major Use

Woodland

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Plant competition

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

5F—Acker-Norling complex, 30 to 60 percent north slopes

Composition

Acker soil and similar inclusions—45 percent
Norling soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from metamorphic rock
Elevation: 1,000 to 4,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, cascade Oregongrape, and western swordfern
Climatic factors:
Mean annual precipitation—40 to 60 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Acker Soil

Typical profile

0 to 5 inches—dark brown gravelly loam
5 to 19 inches—dark brown and strong brown clay loam
19 to 60 inches—strong brown clay loam

Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Norling Soil

Typical profile

0 to 10 inches—brown gravelly loam
10 to 16 inches—strong brown gravelly clay loam
16 to 23 inches—strong brown very gravelly clay loam
23 inches—hard bedrock

Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5 inches

Contrasting Inclusions

- Dubakella and Pearsoll soils underlain by serpentinite and peridotite
- Dumont soils in concave, less sloping positions
- Atring and Kanid soils in convex, more steeply sloping positions
- Acker and Norling soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Acker and Norling

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition

Acker

- Moderately slow permeability

Norling

- Depth to rock
- Hazard of windthrow

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees on the Norling soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

6F—Acker-Norling complex, 30 to 60 percent south slopes

Composition

Acker soil and similar inclusions—40 percent
Norling soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from metamorphic rock
Elevation: 1,000 to 4,000 feet
Native plants: Douglas fir and Pacific madrone with an understory of creambush oceanspray, cascade Oregongrape, whipplevine, and mountain brome
Climatic factors:
Mean annual precipitation—40 to 60 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Acker Soil

Typical profile

0 to 5 inches—dark brown gravelly loam
5 to 19 inches—dark brown and strong brown clay loam
19 to 60 inches—strong brown clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Norling Soil

Typical profile

0 to 10 inches—brown gravelly loam
10 to 16 inches—strong brown gravelly clay loam
16 to 23 inches—strong brown very gravelly clay loam
23 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5 inches

Contrasting Inclusions

- Dubakella and Pearsoll soils underlain by serpentinite and peridotite
- Dumont soils in concave, less sloping positions
- Atring and Kanid soils in convex, more steeply sloping positions
- Acker and Norling soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Acker and Norling

- Steepness of slope
- Hazards of erosion and compaction
- Seedling mortality
- Plant competition

Acker

- Moderately slow permeability

Norling

- Depth to rock
- Hazard of windthrow

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees on the Norling soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

7F—Acker-Norling complex, high elevation, 30 to 60 percent slopes

Composition

Acker soil and similar inclusions—45 percent
Norling soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: North-facing side slopes
Parent material: Colluvium and residuum derived from metamorphic rock
Elevation: 3,000 to 4,000 feet
Native plants: Douglas fir and golden chinkapin with an understory of salal, cascade Oregongrape, Pacific rhododendron, and western swordfern
Climatic factors:
Mean annual precipitation—60 to 75 inches
Mean annual air temperature—42 to 45 degrees F
Frost-free period—50 to 100 days

Acker Soil

Typical profile

0 to 4 inches—dark yellowish brown gravelly loam
4 to 19 inches—strong brown clay loam
19 to 60 inches—yellowish red clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Norling Soil

Typical profile

0 to 2 inches—dark brown gravelly loam
2 to 13 inches—strong brown gravelly loam
13 to 28 inches—dark yellowish brown gravelly clay loam
28 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained

Permeability: Moderate
Available water capacity: About 5 inches

Contrasting Inclusions

- Atring and Kanid soils in convex, more steeply sloping positions
- Dumont soils in concave, less sloping positions
- Acker and Norling soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Acker and Norling

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition

Acker

- Moderately slow permeability

Norling

- Depth to rock
- Hazard of windthrow

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees on the Norling soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

8E—Atring gravelly loam, 12 to 30 percent slopes

Composition

Atring soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Ridges and side slopes
Parent material: Colluvium derived from sandstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 9 inches—dark grayish brown gravelly loam
9 to 20 inches—brown very gravelly loam
20 to 35 inches—yellowish brown very gravelly loam
35 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

- Speaker soils
- Larmine soils in convex, more steeply sloping positions
- Kanid and Rosehaven soils in concave positions
- Atring soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

- Hazards of erosion and compaction
- High amount of rock fragments in the soil
- Steepness of slope
- Plant competition
- Seedling mortality
- Depth to rock
- Hazard of windthrow

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

8F—Atring gravelly loam, 30 to 60 percent slopes

Composition

Atring soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes and ridges
Parent material: Colluvium derived from sandstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 9 inches—dark grayish brown gravelly loam
9 to 20 inches—brown very gravelly loam
20 to 35 inches—yellowish brown very gravelly loam
35 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

• Speaker soils
• Larmine soils in convex, more steeply sloping positions
• Kanid and Rosehaven soils in concave, less sloping positions
• Atring soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

• Steepness of slope
• Hazards of erosion and compaction
• High amount of rock fragments in the soil
• Plant competition
• Seedling mortality
• Depth to rock
• Hazard of windthrow

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.

- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

8G—Atring gravelly loam, 60 to 90 percent slopes

Composition

Atring soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from sandstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 9 inches—dark grayish brown gravelly loam
9 to 20 inches—brown very gravelly loam
20 to 35 inches—yellowish brown very gravelly loam
35 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

- Speaker soils
- Rock outcrop and Larmine soils in convex, more steeply sloping positions
- Kanid and Rosehaven soils in concave, less sloping positions
- Atring soils that have a very gravelly or extremely gravelly surface layer
- Atring soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- High amount of rock fragments in the soil
- Hazard of slope failure
- Plant competition
- Seedling mortality
- Depth to rock
- Hazard of windthrow

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from

undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

9G—Atring very gravelly loam, high elevation, 60 to 90 percent slopes

Composition

Atring soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: North-facing side slopes
Parent material: Colluvium derived from metamorphic rock
Elevation: 3,000 to 4,000 feet
Native plants: Douglas fir and golden chinkapin with an understory of salal, cascade Oregongrape, Pacific rhododendron, and western swordfern
Climatic factors:
Mean annual precipitation—60 to 80 inches
Mean annual air temperature—42 to 45 degrees F
Frost-free period—50 to 100 days

Typical Profile

0 to 3 inches—very dark grayish brown very gravelly loam
3 to 11 inches—brown very gravelly loam
11 to 26 inches—strong brown very gravelly clay loam
26 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

- Norling soils
- McMullin, Reston, and Vermisa soils and Rock outcrop in convex, more steeply sloping positions
- Acker and Kanid soils in concave, less sloping positions
- Atring soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Plant competition
- Seedling mortality
- Depth to rock
- Hazard of windthrow

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soil is dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

10E—Atring-Larmine complex, 12 to 30 percent slopes

Composition

Atring soil and similar inclusions—50 percent
Larmine soil and similar inclusions—25 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Ridges and side slopes
Parent material: Colluvium derived from sandstone
Elevation: 250 to 2,600 feet
Native plants: Atring—Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine; Larmine—Douglas fir and bigleaf maple with an understory of western swordfern, cascade Oregongrape, whipplevine, and mountain brome
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Atring Soil

Typical profile

0 to 9 inches—dark grayish brown gravelly loam
9 to 20 inches—brown very gravelly loam
20 to 35 inches—yellowish brown very gravelly loam
35 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Larmine Soil

Typical profile

0 to 3 inches—dark grayish brown gravelly loam
3 to 19 inches—yellowish brown very gravelly loam and extremely gravelly loam
19 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 1.5 inches

Contrasting Inclusions

• Speaker soils
• Kanid and Rosehaven soils in concave positions
• Atring and Larmine soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Atring and Larmine

• Hazards of erosion and compaction
• High amount of rock fragments in the soil
• Steepness of slope
• Seedling mortality
• Plant competition
• Depth to rock

Larmine

• Hazard of windthrow

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees on the Larmine soil commonly are subject to

windthrow during periods when the soil is excessively wet and winds are strong.

10F—Atring-Larmine complex, 30 to 60 percent slopes

Composition

Atring soil and similar inclusions—45 percent
Larmine soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes and ridges
Parent material: Colluvium derived from sandstone
Elevation: 250 to 2,600 feet
Native plants: Atring—Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine; Larmine—Douglas fir and bigleaf maple with an understory of western swordfern, cascade Oregongrape, whipplevine, and mountain brome
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Atring Soil

Typical profile

0 to 9 inches—dark grayish brown gravelly loam
9 to 20 inches—brown very gravelly loam
20 to 35 inches—yellowish brown very gravelly loam
35 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Larmine Soil

Typical profile

0 to 3 inches—dark grayish brown gravelly loam
3 to 19 inches—yellowish brown very gravelly loam and extremely gravelly loam
19 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 1.5 inches

Contrasting Inclusions

- Speaker soils
- Kanid and Rosehaven soils in concave, less sloping positions
- Atring and Larmine soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Atring and Larmine

- Steepness of slope
- Hazards of erosion and compaction
- High amount of rock fragments in the soil
- Seedling mortality
- Plant competition
- Depth to rock

Larmine

- Hazard of windthrow

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from

undesirable understory plants and helps to retain moisture in summer.
- Trees on the Larmine soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

10G—Atring-Larmine complex, 60 to 90 percent slopes

Composition

Atring soil and similar inclusions—40 percent
Larmine soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from sandstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Atring Soil

Typical profile

0 to 9 inches—dark grayish brown gravelly loam
9 to 20 inches—brown very gravelly loam
20 to 35 inches—yellowish brown very gravelly loam
35 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Larmine Soil

Typical profile

0 to 3 inches—dark grayish brown gravelly loam
3 to 19 inches—yellowish brown very gravelly loam and extremely gravelly loam
19 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 1.5 inches

Contrasting Inclusions

- Speaker soils
- Rock outcrop in convex, more steeply sloping positions
- Kanid and Rosehaven soils in concave, less sloping positions
- Atring soils that have a very gravelly or extremely gravelly surface layer
- Atring and Larmine soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Atring and Larmine

- Steepness of slope
- Hazards of erosion and compaction
- High amount of rock fragments in the soil
- Hazard of slope failure
- Seedling mortality
- Plant competition
- Depth to rock

Larmine

- Hazard of windthrow

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted

seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees on the Larmine soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

11F—Atring-Larmine-Rock outcrop complex, 30 to 60 percent slopes

Composition

Atring soil and similar inclusions—30 percent
Larmine soil and similar inclusions—30 percent
Rock outcrop—25 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Atring and Larmine—side slopes and ridges; Rock outcrop—side slopes
Parent material: Colluvium derived from sandstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Atring Soil

Typical profile

0 to 9 inches—dark grayish brown gravelly loam
9 to 20 inches—brown very gravelly loam
20 to 35 inches—yellowish brown very gravelly loam
35 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Larmine Soil

Typical profile

0 to 3 inches—dark grayish brown gravelly loam
3 to 19 inches—yellowish brown very gravelly loam and extremely gravelly loam
19 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 1.5 inches

Rock Outcrop

Description: Areas of exposed bedrock

Contrasting Inclusions

• Speaker soils
• Kanid and Rosehaven soils in concave, less sloping positions
• Atring and Larmine soils that have a very cobbly or very stony surface layer and are below areas of Rock outcrop
• Atring and Larmine soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Map unit

• Areas of Rock outcrop

Atring and Larmine

• Steepness of slope
• Hazards of erosion and compaction
• High amount of rock fragments in the soil
• Seedling mortality
• Plant competition
• Depth to rock

Larmine

• Hazard of windthrow

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding

or mulching because of the large amount of exposed, fractured bedrock.

• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Avoiding areas with a high amount of Rock outcrop will minimize breakage of timber and increase the efficiency of yarding operations.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees on the Larmine soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

11G—Atring-Larmine-Rock outcrop complex, 60 to 90 percent slopes

Composition

Atring soil and similar inclusions—30 percent
Larmine soil and similar inclusions—30 percent
Rock outcrop—25 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Atring—side slopes; Larmine and Rock outcrop—side slopes and headwalls
Parent material: Colluvium derived from sandstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Atring Soil

Typical profile

0 to 9 inches—dark grayish brown gravelly loam
9 to 20 inches—brown very gravelly loam
20 to 35 inches—yellowish brown very gravelly loam
35 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Larmine Soil

Typical profile

0 to 3 inches—dark grayish brown gravelly loam
3 to 19 inches—yellowish brown very gravelly loam and extremely gravelly loam
19 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 1.5 inches

Rock Outcrop

Description: Areas of exposed bedrock

Contrasting Inclusions

• Speaker soils
• Kanid and Rosehaven soils in concave, less sloping positions
• Atring and Larmine soils that have a very cobbly or very stony surface layer and are below areas of Rock outcrop
• Atring and Larmine soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Map unit

• Areas of Rock outcrop

Atring and Larmine

• Steepness of slope
• Hazards of erosion and compaction
• High amount of rock fragments in the soil
• Hazard of slope failure
• Seedling mortality

- Plant competition
- Depth to rock

Larmine

- Hazard of windthrow

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- Avoiding areas that have a high amount of Rock outcrop will minimize breakage of timber and increase the efficiency of yarding operations.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the Larmine soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

12F—Atring-Vermisa complex, 30 to 60 percent north slopes

Composition

Atring soil and similar inclusions—45 percent
Vermisa soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from metamorphic rock
Elevation: 1,000 to 4,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, cascade Oregongrape, and western swordfern
Climatic factors:
Mean annual precipitation—40 to 60 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Atring Soil

Typical profile

0 to 9 inches—very dark brown very gravelly loam
9 to 39 inches—brown very gravelly loam
39 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Vermisa Soil

Typical profile

0 to 4 inches—dark yellowish brown very gravelly loam
4 to 17 inches—yellowish brown extremely gravelly loam
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 2 inches

Contrasting Inclusions

- Norling soils
- McMullin and Reston soils and Rock outcrop in convex, more steeply sloping positions
- Acker and Kanid soils in concave, less sloping positions
- Atring soils that have slopes of less than 30 percent and Atring and Vermisa soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Atring and Vermisa

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Plant competition
- Seedling mortality
- Depth to rock

Vermisa

- Hazard of windthrow

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Vermisa soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

12G—Atring-Vermisa complex, 60 to 90 percent north slopes

Composition

Atring soil and similar inclusions—40 percent
Vermisa soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Atring—side slopes; Vermisa—side slopes and headwalls
Parent material: Colluvium derived from metamorphic rock
Elevation: 1,000 to 4,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, cascade Oregongrape, and western swordfern
Climatic factors:
Mean annual precipitation—40 to 60 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Atring Soil

Typical profile

0 to 9 inches—very dark brown very gravelly loam
9 to 39 inches—brown very gravelly loam
39 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Vermisa Soil

Typical profile

0 to 4 inches—dark yellowish brown very gravelly loam
4 to 17 inches—yellowish brown extremely gravelly loam
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 2 inches

Contrasting Inclusions

- Norling soils
- McMullin and Reston soils and Rock outcrop in convex, more steeply sloping positions
- Acker and Kanid soils in concave, less sloping positions
- Dubakella and Pearsoll soils underlain by serpentinite and peridotite

• Atring and Vermisa soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Atring and Vermisa

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Plant competition
- Seedling mortality
- Depth to rock

Vermisa

- Hazard of windthrow

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soils are dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Vermisa soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

13G—Atring-Vermisa complex, 60 to 90 percent south slopes

Composition

Atring soil and similar inclusions—40 percent
Vermisa soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Atring—side slopes; Vermisa—side slopes and headwalls
Parent material: Colluvium derived from metamorphic rock
Elevation: 1,000 to 4,000 feet
Native plants: Atring—Douglas fir and Pacific madrone with an understory of creambush oceanspray, cascade Oregongrape, whipplevine, and mountain brome; Vermisa—Douglas fir with an understory of hairy honeysuckle, Pacific poison oak, canyon live oak, and California fescue
Climatic factors:
Mean annual precipitation—40 to 60 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Atring Soil

Typical profile

0 to 9 inches—very dark brown very gravelly loam
9 to 39 inches—brown very gravelly loam
39 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Vermisa Soil

Typical profile

0 to 4 inches—dark yellowish brown very gravelly loam
4 to 17 inches—yellowish brown extremely gravelly loam
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Somewhat excessively drained

Permeability: Moderately rapid
Available water capacity: About 2 inches

Contrasting Inclusions

- Norling soils
- McMullin and Reston soils and Rock outcrop in convex, more steeply sloping positions
- Acker and Kanid soils in concave, less sloping positions
- Dubakella and Pearsoll soils underlain by serpentinite and peridotite
- Atring and Vermisa soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Atring and Larmine

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Seedling mortality
- Plant competition
- Depth to rock

Vermisa

- Hazard of windthrow
- Hazard of fire damage

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soils are dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- On the Vermisa soil, increased erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees on the Vermisa soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

14A—Banning loam, 0 to 3 percent slopes

Composition

Banning soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Terraces
Landscape position: Low terraces
Parent material: Mixed alluvium
Elevation: 700 to 1,500 feet
Native plants: Oregon white oak and Oregon ash with an understory of Pacific poison oak, common snowberry, rose, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 2 inches—very dark brown loam
2 to 15 inches—very dark brown clay loam
15 to 35 inches—very dark grayish brown gravelly clay loam
35 to 60 inches—dark brown clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 12 to 36 inches in December through May
Permeability: Moderately slow
Available water capacity: About 10 inches

Contrasting Inclusions

- Foehlin, Medford, and Packard soils
- Conser soils in swales
- Sibold soils on flood plains

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

- Wetness
- Hazard of compaction
- Moderately slow permeability
- Low soil strength

Use and Management

Cropland

- Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Leveling is needed in sloping areas.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate wetness.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
- If a suitable outlet is available, tile drains can be used to divert subsurface water away from the absorption field.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Reduce wetness by installing drain tile around footings and by providing drainage around buildings with basements and crawl spaces.
- Roads should be designed to offset the limited ability of the soil to support a load.

14C—Banning loam, 3 to 12 percent slopes

Composition

Banning soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Hills
Landscape position: Alluvial fans
Parent material: Mixed alluvium
Elevation: 700 to 1,500 feet
Native plants: Oregon white oak and Oregon ash with an understory of Pacific poison oak, common snowberry, rose, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 2 inches—very dark brown loam
2 to 15 inches—very dark brown clay loam
15 to 35 inches—very dark grayish brown gravelly clay loam
35 to 60 inches—dark brown clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 12 to 36 inches in December through May
Permeability: Moderately slow
Available water capacity: About 10 inches

Contrasting Inclusions

- Abegg, Foehlin, and Medford soils
- Dupee, Pengra, Sutherlin, and Veneta soils
- Panther soils near drainageways
- Banning soils that have slopes of more than 12 percent

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

- Wetness
- Hazards of compaction and erosion
- Moderately slow permeability
- Low soil strength

Use and Management

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate wetness.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
- If a suitable outlet is available, tile drains can be used to divert subsurface water away from the absorption field.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
- Roads should be designed to offset the limited ability of the soil to support a load.
- Seed cuts and fills to permanent vegetation.

14D—Banning loam, 12 to 20 percent slopes

Composition

Banning soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Hills
Landscape position: Alluvial fans
Parent material: Mixed alluvium
Elevation: 700 to 1,500 feet
Native plants: Oregon white oak and Oregon ash with an understory of Pacific poison oak, common snowberry, rose, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 2 inches—very dark brown loam
2 to 15 inches—very dark brown clay loam
15 to 35 inches—very dark grayish brown gravelly clay loam
35 to 60 inches—dark brown clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 12 to 36 inches in December through May
Permeability: Moderately slow
Available water capacity: About 10 inches

Contrasting Inclusions

- Abegg, Foehlin, and Medford soils
- Dupee, Pengra, Sutherlin, and Veneta soils
- Banning soils that have slopes of less than 12 percent

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

- Wetness
- Hazards of erosion and compaction

- Steepness of slope
- Moderately slow permeability
- Hazard of slope failure
- Low soil strength

Use and Management

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and by using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate wetness.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
- If a suitable outlet is available, tile drains can be used to divert subsurface water away from the absorption field.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
- Roads should be designed to offset the limited ability of the soil to support a load.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Slumping can be minimized by restricting the construction of roads and other activities that disturb the soil to the less sloping or more well drained areas and by using properly designed road drainage systems.
- Seed cuts and fills to permanent vegetation.

15A—Bashaw clay, 0 to 1 percent slopes

Composition

Bashaw soil and similar inclusions—90 percent
Contrasting inclusions—10 percent

Setting

Landform: Terraces
Landscape position: Intermediate terraces
Parent material: Clayey alluvium
Elevation: 400 to 800 feet
Native plants: Oregon white oak and Oregon ash with an understory of common snowberry, Pacific poison oak, rose, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 14 inches—black clay
14 to 63 inches—very dark gray clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Poorly drained
Depth to water table: 12 inches above the surface to a depth of 6 inches below the surface in November through May
Permeability: Very slow
Available water capacity: About 9 inches
Shrink-swell potential: High

Contrasting Inclusions

- Curtin soils on alluvial fans and in more steeply sloping positions

- Waldo soils on flood plains
- Bashaw soils that have slopes of more than 1 percent

Major Uses

Hay and pasture, urban and homesite development, and wetland management

Major Management Limitations

- Wetness
- High shrink-swell potential
- Very slow permeability
- Hazard of compaction
- High clay content
- Low soil strength

Use and Management

Hay and pasture

- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate wetness.
- Reduce the risk of compaction of the surface layer by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- In many areas, it may be necessary to haul in topsoil for lawns and gardens.
- This soil generally is not suitable for septic tank absorption fields; however, areas of suitable included soils may be in this unit. Onsite investigation is needed to locate such soils.
- Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
- Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
- Reduce wetness by installing drain tile around footings and by providing drainage around buildings with basements and crawl spaces.
- Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.

16C—Bateman silt loam, 3 to 12 percent slopes

Composition

Bateman soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Toeslopes and broad ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 7 inches—dark brown silt loam
7 to 50 inches—dark brown and reddish brown silty clay loam
50 to 63 inches—dark brown gravelly silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

- Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways
- Oakland soils in convex, more steeply sloping positions
- Bateman soils that have slopes of more than 12 percent

Major Uses

Woodland, cropland, pasture, and homesite development

Major Management Limitations

- Hazards of compaction and erosion
- Plant competition

- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Use conventional equipment in harvesting, but limit its use when the soil is wet.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and by using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Roads should be designed to offset the limited ability of the soil to support a load.
- Seed cuts and fills to permanent vegetation.

16E—Bateman silt loam, 12 to 30 percent slopes

Composition

Bateman soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Footslopes and broad ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 7 inches—dark brown silt loam
7 to 50 inches—dark brown and reddish brown silty clay loam
50 to 63 inches—dark brown gravelly silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

- Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways
- Oakland soils in convex, more steeply sloping positions
- Bateman soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Woodland, cropland, pasture, and homesite development

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Plant competition
- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Cropland

- Sprinkler and trickle irrigation systems are suited to the less sloping areas of this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the limited ability of the soil to support a load.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

16F—Bateman silt loam, 30 to 60 percent slopes

Composition

Bateman soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes and ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 7 inches—dark brown silt loam

7 to 50 inches—dark brown and reddish brown silty clay loam
50 to 63 inches—dark brown gravelly silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

- Kanid soils
- Oakland soils in convex positions
- Atring soils in convex, more steeply sloping positions
- Dupee and Sutherlin soils in concave, less sloping positions
- Bateman soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

17—Beaches

Composition

Beaches—90 percent
Contrasting inclusions—10 percent

Setting

Landform: Beach
Slope: 1 to 5 percent
Elevation: 0 to 10 feet
Native plants: None

Description of Beaches

Beaches consists of areas of loose sand and shell fragments that have been worked and reworked by waves, tides, and wind and are still subject to such action.

Contrasting Inclusions

- Duneland
- Heceta and Waldport soils
- Rock outcrop
- Areas of Beaches that are cobbly

Major Uses

Recreation and wildlife habitat

18E—Beal loam, 12 to 30 percent slopes

Composition

Beal soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Footslopes
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 1,100 to 2,800 feet
Native plants: Douglas fir and ponderosa pine with an understory of tall Oregongrape, Pacific poison oak, whipplevine, and mountain brome
Climatic factors:
Mean annual precipitation—40 to 50 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 200 days

Typical Profile

0 to 10 inches—very dark grayish brown and dark brown loam

10 to 18 inches—dark yellowish brown loam
18 to 39 inches—dark yellowish brown clay loam
39 to 60 inches—olive clay loam and clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 24 to 36 inches in November through May
Permeability: Moderately slow
Available water capacity: About 10 inches

Contrasting Inclusions

- Lettia soils in convex positions
- Soils that are similar to this Beal soil but are less than 40 inches deep to bedrock
- Zing soils that are in concave positions and near drainageways
- Soils that are poorly drained and are in concave positions and near drainageways
- Beal soils that have slopes of less than 12 percent or more than 30 percent

Major Use

Hay and pasture

Major Management Limitations

- Steepness of slope
- Wetness
- Hazards of erosion and compaction
- Moderately slow permeability
- Hazard of slope failure
- Plant competition

Use and Management

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

19F—Beekman-Vermisa complex, 30 to 60 percent south slopes

Composition

Beekman soil and similar inclusions—40 percent
Vermisa soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from metamorphic rock
Elevation: 500 to 4,000 feet
Native plants: Douglas fir and ponderosa pine with an understory of tall Oregongrape, canyon live oak, whipplevine, and California fescue
Climatic factors:
Mean annual precipitation—35 to 50 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 200 days

Beekman Soil

Typical profile

0 to 5 inches—brown gravelly loam
5 to 18 inches—dark yellowish brown very gravelly loam
18 to 26 inches—dark yellowish brown very gravelly clay loam
26 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 3 inches

Vermisa Soil

Typical profile

0 to 4 inches—dark yellowish brown very gravelly loam
4 to 17 inches—yellowish brown extremely gravelly loam
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 2 inches

Contrasting Inclusions

- Speaker soils
- McMullin and Reston soils and Rock outcrop in convex, more steeply sloping positions
- Josephine soils in concave, less sloping positions
- Soils that are similar to the Beekman soil but have bedrock at depth of 40 inches or more and are in concave, less sloping positions

• Beekman soils that have slopes of less than 30 percent
• Beekman and Vermisa soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Beekman and Vermisa

• Steepness of slope
• Hazard of erosion
• High amount of rock fragments on the surface and in the soil
• Seedling mortality
• Plant competition
• Depth to rock

Vermisa

• Hazard of windthrow
• Hazard of fire damage

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• On the Vermisa soil, an increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
• Trees on the Vermisa soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

19G—Beekman-Vermisa complex, 60 to 90 percent south slopes

Composition

Beekman soil and similar inclusions—40 percent
Vermisa soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Beekman—side slopes; Vermisa—side slopes and headwalls
Parent material: Colluvium derived from metamorphic rock
Elevation: 500 to 4,000 feet
Native plants: Douglas fir and ponderosa pine with an understory of tall Oregongrape, canyon live oak, whipplevine, and California fescue
Climatic factors:
Mean annual precipitation—35 to 50 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 200 days

Beekman Soil

Typical profile

0 to 5 inches—brown gravelly loam
5 to 18 inches—dark yellowish brown very gravelly loam
18 to 26 inches—dark yellowish brown very gravelly clay loam
26 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 3 inches

Vermisa Soil

Typical profile

0 to 4 inches—dark yellowish brown very gravelly loam
4 to 17 inches—yellowish brown extremely gravelly loam
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches

Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 2 inches

Contrasting Inclusions

• Speaker soils
• McMullin and Reston soils and Rock outcrop in convex, more steeply sloping positions
• Josephine soils in concave, less sloping positions
• Soils that are similar to the Beekman soil but have bedrock at depth of 40 inches or more and are in concave, less sloping positions
• Beekman and Vermisa soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Beekman and Vermisa

• Steepness of slope
• Hazard of erosion
• High amount of rock fragments on the surface and in the soil
• Hazard of slope failure
• Seedling mortality
• Plant competition
• Depth to rock

Vermisa

• Hazard of windthrow
• Hazard of fire damage

Use and Management

Woodland

• Highlead or other cable logging systems are best suited to this unit.
• When the soils are dry, landings can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Headwall areas should be avoided when constructing roads.
• Providing artificial shade (fig. 6), leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• On the Vermisa soil, an increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
• Trees on the Vermisa soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

20G—Beekman-Vermisa complex, 60 to 90 percent north slopes

Composition

Beekman soil and similar inclusions—40 percent
Vermisa soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Beekman—side slopes; Vermisa—side slopes and headwalls
Parent material: Colluvium derived from metamorphic rock
Elevation: 500 to 4,000 feet
Native plants: Douglas fir and Pacific madrone with an understory of cascade Oregongrape, whipplevine, creambush oceanspray, and common snowberry
Climatic factors:
Mean annual precipitation—35 to 50 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 200 days

Beekman Soil

Typical profile

0 to 5 inches—brown gravelly loam
5 to 18 inches—dark yellowish brown very gravelly loam
18 to 26 inches—dark yellowish brown very gravelly clay loam
26 inches—hard bedrock

Figure 6.—Shade cards used to protected seedlings on Beekman-Vermisa complex, 60 to 90 percent south slopes.

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 3 inches

Vermisa Soil

Typical profile

0 to 4 inches—dark yellowish brown very gravelly loam
4 to 17 inches—yellowish brown extremely gravelly loam
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 2 inches

Contrasting Inclusions

- Speaker soils
- McMullin and Reston soils and Rock outcrop in convex, more steeply sloping positions
- Josephine soils in concave, less sloping positions
- Soils that are similar to the Beekman soil but have

bedrock at depth of 40 inches or more and are in concave, less sloping positions
- Beekman and Vermisa soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Beekman and Vermisa

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Plant competition
- Seedling mortality
- Depth to rock

Vermisa

- Hazard of windthrow

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soils are dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Vermisa soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

21C—Bellpine silt loam, 3 to 12 percent slopes

Composition

Bellpine soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills of the Interior Mountains
Landscape position: Ridges and toeslopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 11 inches—dark brown and dark reddish brown silt loam
11 to 30 inches—yellowish red silty clay
30 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4.5 inches

Contrasting Inclusions

- Windygap soils in concave positions
- Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways
- Bellpine soils that have slopes of more than 12 percent

Major Uses

Cropland, pasture, woodland, and homesite development

Major Management Limitations

- Hazards of compaction and erosion

- Plant competition
- Moderately slow permeability
- Depth to rock
- Low soil strength
- Hazard of windthrow

Use and Management

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

- Use conventional equipment in harvesting, but limit its use when the soil is wet.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock. Onsite investigation is needed to locate these areas.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Roads should be designed to offset the limited ability of the soil to support a load.
- Seed cuts and fills to permanent vegetation.

21E—Bellpine silt loam, 12 to 30 percent slopes

Composition

Bellpine soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills of the Interior Mountains
Landscape position: Ridges and footslopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 11 inches—dark brown and dark reddish brown silt loam
11 to 30 inches—yellowish red silty clay
30 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained

Permeability: Moderately slow
Available water capacity: About 4.5 inches

Contrasting Inclusions

- Windygap soils in concave positions
- Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways
- Atring and Nonpareil soils in convex, more steeply sloping positions
- Bellpine soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Woodland, cropland, pasture, and homesite development

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Plant competition
- Moderately slow permeability
- Depth to rock
- Low soil strength
- Hazard of windthrow

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Cropland

- Sprinkler and trickle irrigation systems are suited to the less sloping areas of this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock. Onsite investigation is needed to locate these areas.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the limited ability of the soil to support a load.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

21F—Bellpine silt loam, 30 to 60 percent slopes

Composition

Bellpine soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Interior Mountains
Landscape position: Side slopes and ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 11 inches—dark brown and dark reddish brown silt loam
11 to 30 inches—yellowish red silty clay
30 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4.5 inches

Contrasting Inclusions

- Kanid soils
- Windygap soils in concave positions
- Atring and Nonpareil soils in convex, more steeply sloping positions
- Dupee and Sutherlin soils in concave, less sloping positions
- Bellpine soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Depth to rock
- Low soil strength
- Hazard of windthrow

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

22C—Bellpine clay loam, 3 to 12 percent slopes

Composition

Bellpine soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Klamath Mountains
Landscape position: Ridges and toeslopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 700 to 2,700 feet
Native plants: Douglas fir and grand fir with an understory of salal, cascade Oregongrape, western hazel, and California fescue
Climatic factors:
Mean annual precipitation—40 to 50 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—150 to 200 days

Typical Profile

0 to 3 inches—dark brown clay loam
3 to 18 inches—brown clay loam
18 to 25 inches—strong brown clay
25 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained

Permeability: Moderately slow
Available water capacity: About 5.5 inches

Contrasting Inclusions

• Windygap soils in concave positions
• McNab soils in concave positions and near drainageways
• Dicecreek soils in convex, more steeply sloping positions
• Bellpine soils that have slopes of more than 12 percent

Major Uses

Cropland, pasture, woodland, and homesite development

Major Management Limitations

• Hazards of compaction and erosion
• Plant competition
• Moderately slow permeability
• Depth to rock
• Low soil strength
• Hazard of windthrow

Use and Management

Cropland

• Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

• Use conventional equipment in harvesting, but limit its use when the soil is wet.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock. Onsite investigation is needed to locate these areas.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Roads should be designed to offset the limited ability of the soil to support a load.
• Seed cuts and fills to permanent vegetation.

22E—Bellpine clay loam, 12 to 30 percent slopes

Composition

Bellpine soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Klamath Mountains
Landscape position: Footslopes and ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 700 to 2,700 feet
Native plants: Douglas fir and grand fir with an

understory of salal, cascade Oregongrape, western hazel, and California fescue

Climatic factors:

Mean annual precipitation—40 to 50 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—150 to 200 days

Typical Profile

0 to 3 inches—dark brown clay loam
3 to 18 inches—brown clay loam
18 to 25 inches—strong brown clay
25 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Contrasting Inclusions

- Windygap soils in concave positions
- McNab soils in concave positions and near drainageways
- Dicecreek soils in convex, more steeply sloping positions
- Bellpine soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Woodland, cropland, and pasture

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Plant competition
- Moderately slow permeability
- Depth to rock
- Low soil strength
- Hazard of windthrow

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Cropland

- Sprinkler and trickle irrigation systems are suited to the less sloping areas of this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

23F—Bellpine-Windygap complex, 30 to 60 percent slopes

Composition

Bellpine soil and similar inclusions—45 percent
Windygap soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Interior Mountains
Landscape position: Bellpine—convex side slopes and ridges; Windygap—concave side slopes

Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Bellpine Soil

Typical profile

0 to 11 inches—dark brown and dark reddish brown silt loam
11 to 30 inches—yellowish red silty clay
30 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4.5 inches

Windygap Soil

Typical profile

0 to 7 inches—dark brown silt loam
7 to 55 inches—dark red silty clay
55 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

- Kanid soils
- Atring and Nonpareil soils in convex, more steeply sloping positions
- Dupee and Sutherlin soils in concave, less sloping positions
- Bellpine and Windygap soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Bellpine and Windygap

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Low soil strength
- Moderately slow permeability

Bellpine

- Depth to rock
- Hazard of windthrow

Windygap

- Hazard of slope failure

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- The Windygap soil is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Slumping of the Windygap soil can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees on the Bellpine soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

24C—Bickford silt loam, 3 to 12 percent slopes

Composition

Bickford soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Toeslopes
Parent material: Colluvium over older clayey alluvium
Elevation: 250 to 750 feet
Native plants: Douglas fir and western redcedar with an understory of red alder, western swordfern, vine maple, and sedges
Climatic factors:
Mean annual precipitation—60 to 90 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—160 to 240 days

Typical Profile

0 to 5 inches—very dark gray silt loam
5 to 12 inches—very dark grayish brown silty clay loam
12 to 16 inches—grayish brown silt loam
16 to 42 inches—gray clay
42 to 60 inches—light olive gray silty clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 6 to 18 inches in November through May
Permeability: Moderate above the clay layer and very slow through it
Available water capacity: About 9 inches
Shrink-swell potential: High

Contrasting Inclusions

• Natal and Wintley soils on terraces
• Bickford soils that have slopes of more than 12 percent

Major Uses

Woodland and wildlife habitat

Major Management Limitations

• Wetness
• Hazards of compaction and erosion
• Plant competition
• Depth to the clay layer
• Hazard of windthrow
• Very slow permeability through the clay layer
• Low soil strength

Use and Management

Woodland

• Because the soil is unsuited to traffic when wet, use equipment only during dry periods.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

25C—Bigdutch gravelly loam, 3 to 12 percent slopes

Composition

Bigdutch soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Plateaus
Landscape position: Ridges
Parent material: Residuum and colluvium derived from sandstone
Elevation: 2,700 to 3,900 feet
Native plants: Douglas fir and western hemlock with an understory of salal, golden chinkapin, Pacific rhododendron, and red huckleberry
Climatic factors:
Mean annual precipitation—55 to 70 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Typical Profile

0 to 4 inches—dark brown gravelly loam
4 to 17 inches—dark brown gravelly loam
17 to 21 inches—dark brown very cobbly clay loam
21 inches—hard sandstone

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained

Permeability: Moderate
Available water capacity: About 5 inches

Contrasting Inclusions

- Soils that are similar to this Bigdutch soil but are less than 20 inches deep to bedrock and are in convex, more steeply sloping positions
- Soils that are similar to this Bigdutch soil but have less than 35 percent rock fragments
- Bigdutch soils that have slopes of more than 12 percent

Major Use

Woodland

Major Management Limitations

- Hazards of compaction and erosion
- High amount of rock fragments in the soil
- Plant competition
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Use conventional equipment in harvesting, but limit its use when the soil is wet.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

25E—Bigdutch gravelly loam, 12 to 30 percent slopes

Composition

Bigdutch soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Plateaus
Landscape position: Ridges and side slopes
Parent material: Residuum and colluvium derived from sandstone
Elevation: 2,700 to 3,900 feet
Native plants: Douglas fir and western hemlock with an understory of salal, golden chinkapin, Pacific rhododendron, and red huckleberry
Climatic factors:
Mean annual precipitation—55 to 70 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Typical Profile

0 to 4 inches—dark brown gravelly loam
4 to 17 inches—dark brown gravelly loam
17 to 21 inches—dark brown very cobbly clay loam
21 inches—hard sandstone

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5 inches

Contrasting Inclusions

- Soils that are similar to this Bigdutch soil but are less than 20 inches deep to bedrock and are in convex, more steeply sloping positions
- Soils that are similar to this Bigdutch soil but have less than 35 percent rock fragments
- Bigdutch soils that have slopes of less than 12 percent or more than 30 percent

Major Use

Woodland

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- High amount of rock fragments in the soil
- Plant competition
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

25F—Bigdutch gravelly loam, 30 to 60 percent slopes

Composition

Bigdutch soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Plateaus
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from sandstone
Elevation: 2,700 to 3,900 feet
Native plants: Douglas fir and western hemlock with an understory of salal, golden chinkapin, Pacific rhododendron, and red huckleberry
Climatic factors:
Mean annual precipitation—55 to 70 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Typical Profile

0 to 4 inches—dark brown gravelly loam
4 to 17 inches—dark brown gravelly loam
17 to 21 inches—dark brown very cobbly clay loam
21 inches—hard sandstone

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5 inches

Contrasting Inclusions

- Soils that are similar to this Bigdutch soil but are less than 20 inches deep to bedrock and are in convex, more steeply sloping positions
- Soils that are similar to this Bigdutch soil but have less than 35 percent rock fragments
- Bigdutch soils that have slopes of less than 30 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- High amount of rock fragments in the soil
- Plant competition
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.

• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

26E—Blachly silty clay loam, 3 to 30 percent slopes

Composition

Blachly soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Broad ridges and side slopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—70 to 110 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Typical Profile

0 to 10 inches—dark reddish brown silty clay loam
10 to 21 inches—dark red clay
21 to 60 inches—red clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 7.5 inches

Contrasting Inclusions

• Preacher soils
• Bohannon soils in convex, more steeply sloping positions
• Soils that are similar to this Blachly soil but have bedrock at a depth of less than 40 inches and are in convex, more steeply sloping positions
• Soils that are similar to this Blachly soil but are poorly drained and are in concave positions and near drainageways
• Blachly soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

• Hazards of compaction and erosion
• Plant competition
• Steepness of slope
• Moderately slow permeability
• Low soil strength

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

26F—Blachly silty clay loam, 30 to 60 percent slopes

Composition

Blachly soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes and ridges
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with

an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—70 to 110 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Typical Profile

0 to 10 inches—dark reddish brown silty clay loam
10 to 21 inches—dark red clay
21 to 60 inches—red clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 7.5 inches

Contrasting Inclusions

- Preacher soils
- Bohannon soils in convex positions
- Soils that are similar to this Blachly soil but have bedrock at a depth of less than 40 inches and are in convex positions
- Damewood and Umpcoos soils in convex, more steeply sloping positions
- Blachly soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

27G—Bohannon-Preacher-Damewood complex, 60 to 90 percent slopes

Composition

Bohannon soil and similar inclusions—30 percent
Preacher soil and similar inclusions—25 percent
Damewood soil and similar inclusions—25 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Bohannon and Damewood—convex side slopes; Preacher—concave side slopes
Parent material: Colluvium derived from sandstone
Elevation: 200 to 2,200 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—70 to 110 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Bohannon Soil

Typical profile

0 to 12 inches—very dark brown and very dark grayish brown gravelly loam
12 to 32 inches—dark brown and dark yellowish brown gravelly loam
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 4 inches

Preacher Soil

Typical profile

0 to 10 inches—dark brown loam
10 to 19 inches—dark brown loam

19 to 34 inches—brown loam
34 to 60 inches—brown clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 10.5 inches

Damewood Soil

Typical profile

0 to 11 inches—very dark brown very gravelly loam
11 to 29 inches—dark brown extremely gravelly loam
29 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Contrasting Inclusions

- Rock outcrop and Umpcoos soils in convex, more steeply sloping positions
- Soils that are similar to the Damewood soil but have bedrock at a depth of more than 40 inches
- Bohannon, Preacher, and Damewood soils that have slopes of less than 60 percent
- Bohannon and Damewood soils that have slopes of more than 90 percent

Major Use

Woodland

Major Management Limitations

Bohannon, Preacher, and Damewood

- Steepness of slope
- Hazard of erosion
- Hazard of slope failure
- Plant competition

Bohannon

- Hazard of compaction
- Depth to rock
- Hazard of windthrow

Preacher

- Hazard of compaction

Damewood

- High amount of rock fragments on the surface and in the soil
- Seedling mortality
- Depth to rock
- Hazard of windthrow

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
- Roadcuts on the Bohannon and Damewood soils do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Bohannon and Damewood soils commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

28A—Bragton muck, 0 to 1 percent slopes

Composition

Bragton soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Flood plains
Landscape position: Low tidal basins and flood plains

Parent material: Organic material over sandy or silty alluvium
Elevation: 0 to 10 feet
Native plants: Bullrushes and sedges
Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—52 to 53 degrees F
Frost-free period—200 to 240 days

Typical Profile

0 to 13 inches—dark brown muck
13 to 38 inches—very dark brown and dark brown muck
38 to 60 inches—very dark gray silt loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Very poorly drained
Depth to water table: 12 inches above the surface to a depth of 24 inches below the surface in January through December
Permeability: Moderate
Available water capacity: About 11 inches
Frequency of flooding: Frequent in January through December

Contrasting Inclusions

- Areas of woody and fibrous peat
- Coquille and Willanch soils on higher flood plains
- Barren tidal flats on lower flood plains

Major Uses

Wildlife habitat and wetland management

Major Management Limitations

- Hazard of flooding
- Wetness
- Hazard of subsidence
- High organic matter content
- Low soil strength

29A—Brand silty clay loam, 0 to 3 percent slopes

Composition

Brand soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Terraces
Landscape position: Low terraces
Parent material: Clayey alluvium
Elevation: 400 to 1,500 feet
Native plants: Oregon white oak and Oregon ash with an understory of common snowberry, Pacific poison oak, rose, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 15 inches—dark grayish brown silty clay loam
15 to 26 inches—grayish brown silty clay
26 to 60 inches—grayish brown clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Poorly drained
Depth to water table: 6 inches above the surface to a depth of 6 inches below the surface in November through May
Permeability: Slow
Available water capacity: About 9 inches
Shrink-swell potential: High

Contrasting Inclusions

- Coburg, Malabon, and Redbell soils on higher terraces
- Waldo soils on flood plains

Major Uses

Hay and pasture, homesite development, and wetland management

Major Management Limitations

- Wetness
- Hazard of compaction
- High shrink-swell potential
- Slow permeability
- High clay content
- Low soil strength

Use and Management

Hay and pasture

- Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Leveling is needed in sloping areas.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

• Select plants that can tolerate wetness.
• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• In many areas, it may be necessary to haul in topsoil for lawns and gardens.
• This soil generally is not suitable for septic tank absorption fields; however, areas of suitable included soils may be in this unit. Onsite investigation is needed to locate these areas.
• Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
• Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.

30D—Buckeye loam, 2 to 20 percent slopes

Composition

Buckeye soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills and mountains
Landscape position: Ridges and footslopes
Parent material: Colluvium and residuum derived from metamorphic rock
Elevation: 600 to 3,000 feet
Native plants: Pacific madrone and Douglas fir with an understory of western swordfern, creambush oceanspray, western hazel, and mountain brome
Climatic factors:
Mean annual precipitation—35 to 45 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 220 days

Typical Profile

0 to 13 inches—very dark grayish brown loam
13 to 25 inches—very dark grayish brown loam
25 to 35 inches—dark brown gravelly clay loam
35 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Contrasting Inclusions

• Rock outcrop and McMullin and Reston soils in convex positions
• Pengra, Sutherlin, and Yoncalla soils in concave positions and near drainageways
• Soils that are similar to this Buckeye soil but have bedrock at a depth of more than 40 inches
• Buckeye soils that have slopes of more than 20 percent

Major Uses

Hay and pasture, woodland, and homesite development

Major Management Limitations

• Hazards of compaction and erosion
• Steepness of slope
• Plant competition
• Seedling mortality
• Moderately slow permeability
• Depth to rock
• Hazard of windthrow

Use and Management

Hay and pasture

• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Tillage and seeding should be done on the contour or across the slope where practical.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

- Use conventional equipment in harvesting, but limit its use when the soil is wet.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock. Onsite investigation is needed to locate these areas.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

30E—Buckeye loam, 20 to 30 percent slopes

Composition

Buckeye soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills and mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from metamorphic rock
Elevation: 600 to 3,000 feet
Native plants: Pacific madrone and Douglas fir with an understory of western swordfern, creambush oceanspray, western hazel, and mountain brome
Climatic factors:
Mean annual precipitation—35 to 45 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 220 days

Typical Profile

0 to 13 inches—very dark grayish brown loam
13 to 25 inches—very dark grayish brown loam
25 to 35 inches—dark brown gravelly clay loam
35 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Contrasting Inclusions

- Rock outcrop and McMullin and Reston soils in convex positions
- Pengra, Sutherlin, and Yoncalla soils in concave positions and near drainageways
- Soils that are similar to this Buckeye soil but have bedrock at a depth of more than 40 inches
- Buckeye soils that have slopes of less than 20 percent or more than 30 percent

Major Uses

Hay and pasture and woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Seedling mortality

- Moderately slow permeability
- Depth to rock
- Hazard of windthrow

Use and Management

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

30F—Buckeye loam, 30 to 60 percent slopes

Composition

Buckeye soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills and mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from metamorphic rock
Elevation: 600 to 3,000 feet
Native plants: Pacific madrone and Douglas fir with an understory of western swordfern, creambush oceanspray, western hazel, and mountain brome
Climatic factors:
Mean annual precipitation—35 to 45 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 220 days

Typical Profile

0 to 13 inches—very dark grayish brown loam
13 to 25 inches—very dark grayish brown loam
25 to 35 inches—dark brown gravelly clay loam
35 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Contrasting Inclusions

- Rock outcrop and McMullin and Reston soils in convex positions
- Sutherlin and Yoncalla soils in concave, less sloping positions
- Soils that are similar to this Buckeye soil but have bedrock at a depth of more than 40 inches
- Buckeye soils that have slopes of less than 30 percent or more than 60 percent

Major Uses

Pasture and woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Seedling mortality
- Plant competition

- Moderately slow permeability
- Depth to rock
- Hazard of windthrow

Use and Management

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.
- Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- On west- and south-facing slopes, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

31E—Buckshot sandy loam, 3 to 30 percent slopes

Composition

Buckshot soil and similar inclusions—90 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Ridges
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 1,200 to 3,500 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, creambush oceanspray, and red huckleberry
Climatic factors:
Mean annual precipitation—50 to 60 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 170 days

Typical Profile

0 to 4 inches—dark brown sandy loam
4 to 30 inches—brown and dark yellowish brown loam
30 to 60 inches—yellowish brown clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

- Stinger soils in convex, more steeply sloping positions
- Zing soils in concave positions and near drainageways
- Soils that are similar to this Buckshot soil but have a clay subsoil
- Buckshot soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

- Hazards of erosion and compaction
- Plant competition
- Steepness of slope
- Moderately slow permeability

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads,

roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

32F—Buckshot sandy loam, 30 to 60 percent north slopes

Composition

Buckshot soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 1,200 to 3,500 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, creambush oceanspray, and red huckleberry
Climatic factors:
Mean annual precipitation—50 to 60 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 170 days

Typical Profile

0 to 4 inches—dark brown sandy loam
4 to 30 inches—brown and dark yellowish brown loam
30 to 60 inches—yellowish brown clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

• Stinger soils in convex, more steeply sloping positions
• Zing soils in concave, less sloping positions
• Soils that are similar to this Buckshot soil but have a clay subsoil and are in concave, less sloping positions
• Buckshot soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

• Hazards of erosion and compaction
• Steepness of slope
• Plant competition
• Moderately slow permeability

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

33G—Buckshot-Stinger complex, 60 to 90 percent north slopes

Composition

Buckshot soil and similar inclusions—40 percent
Stinger soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Buckshot—concave side slopes; Stinger—convex side slopes
Parent material: Colluvium derived from granodiorite

Elevation: 1,200 to 3,500 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, creambush oceanspray, and red huckleberry
Climatic factors:
Mean annual precipitation—50 to 60 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 170 days

Buckshot Soil

Typical profile

0 to 4 inches—dark brown sandy loam
4 to 30 inches—brown and dark yellowish brown loam
30 to 60 inches—yellowish brown clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Stinger Soil

Typical profile

0 to 3 inches—dark brown loam
3 to 30 inches—light olive brown sandy loam
30 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 4.5 inches

Contrasting Inclusions

- Rock outcrop in convex, more steeply sloping positions
- Soils that are similar to the Stinger soil but have more than 35 percent rock fragments and are in convex, more steeply sloping positions
- Stinger soils that have a very gravelly or very cobbly surface layer
- Buckshot soils that have slopes of less than 60 percent
- Stinger soils that have slopes of more than 90 percent

Major Use

Woodland

Major Management Limitations

Buckshot and Stinger

- Steepness of slope
- Hazards of erosion and compaction
- Hazard of slope failure
- Plant competition

Buckshot

- Moderately slow permeability

Stinger

- Depth to rock
- Hazard of windthrow

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils (fig. 7).
- Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees on the Stinger soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

34A—Camas-Newberg complex, 0 to 3 percent slopes

Composition

Camas soil and similar inclusions—45 percent

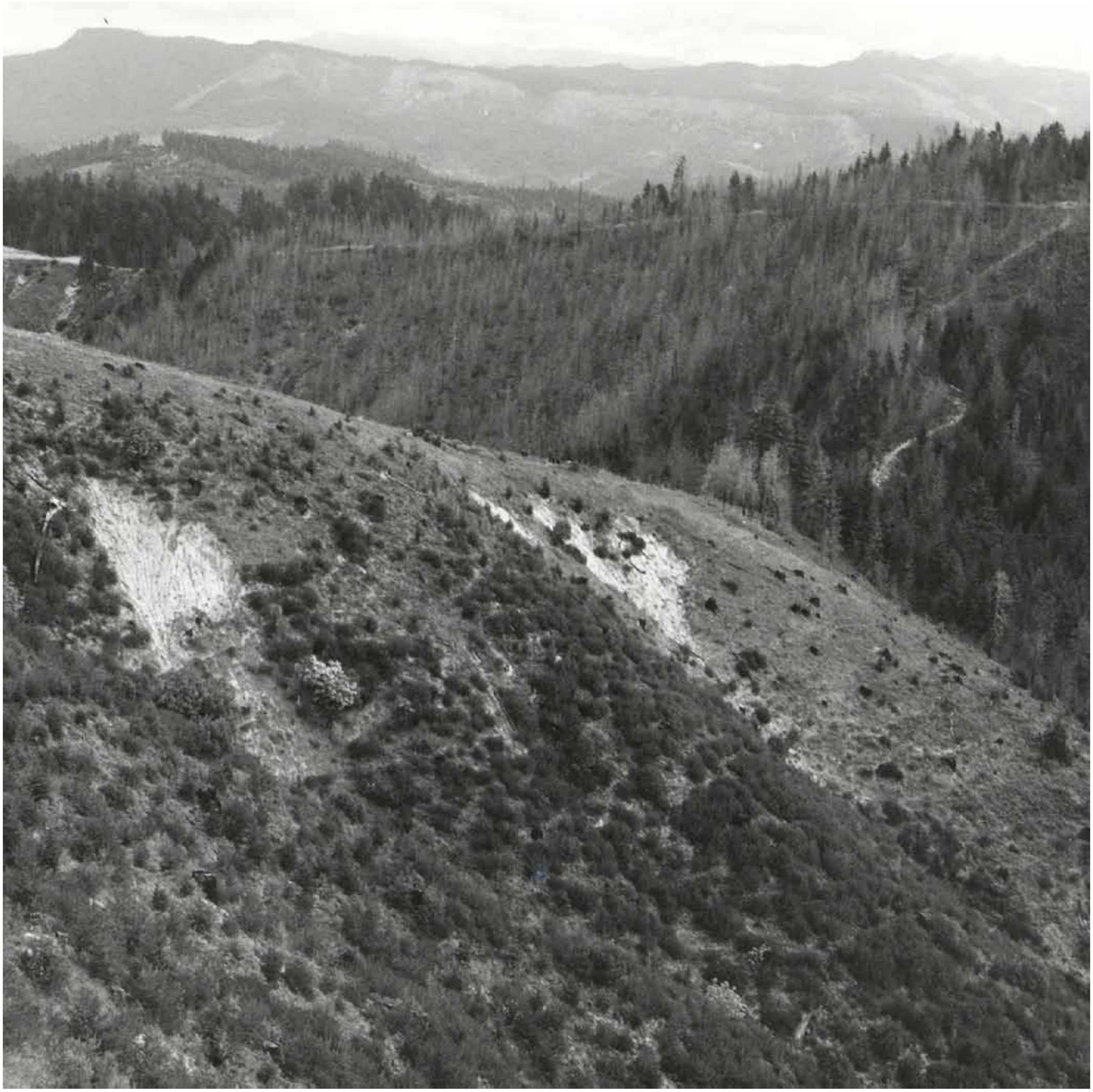


Figure 7.—Slope failure in an area of Buckshot-Stinger complex, 60 to 90 percent north slopes.

Newberg soil and similar inclusions—45 percent
Contrasting inclusions—10 percent

Setting

Landform: Flood plains
Landscape position: Low flood plains
Parent material: Mixed alluvium
Elevation: 400 to 1,600 feet
Native plants: Black cottonwood and Oregon ash with an understory of willow, common snowberry, rose, and blue elderberry
Climatic factors:
Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Camas Soil

Typical profile

0 to 2 inches—very dark grayish brown very gravelly sandy loam
2 to 12 inches—dark brown very gravelly sandy loam
12 to 17 inches—dark yellowish brown very gravelly sandy loam
17 to 60 inches—dark yellowish brown very gravelly loamy sand

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Excessively drained
Permeability: Moderately rapid
Available water capacity: About 3 inches
Frequency of flooding: Frequent in December through April

Newberg Soil

Typical profile

0 to 4 inches—very dark grayish brown fine sandy loam
4 to 19 inches—dark brown fine sandy loam
19 to 35 inches—dark yellowish brown fine sandy loam
35 to 60 inches—dark yellowish brown loamy fine sand

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 7 inches
Frequency of flooding: Frequent in December through April

Contrasting Inclusions

- Evans soils on higher flood plains
- Soils that are similar to the Camas and Newberg soils but are poorly drained
- Riverwash

Major Uses

Hay and pasture, cropland, and wildlife habitat

Major Management Limitations

Camas and Newberg

- Hazard of flooding
- Coarse texture

Camas

- High amount of rock fragments on the surface and in the soil
- Droughtiness

Newberg

- Hazard of compaction

Use and Management

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Applications of irrigation water should be light and frequent.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Reduce the risk of erosion by providing structures along streambanks to control the flow of water and by planting cover crops.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- On the Newberg soil, reduce the risk of compaction of the surface layer by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

35A—Central Point loam, 0 to 3 percent slopes

Composition

Central Point soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Terraces
Landscape position: Low terraces
Parent material: Mixed alluvium
Elevation: 800 to 1,700 feet
Native plants: Douglas fir and Pacific madrone with an

understory of common snowberry, Pacific poison oak, creambush oceanspray, and tall Oregongrape

Climatic factors:

Mean annual precipitation—30 to 45 inches
Mean annual air temperature—52 to 53 degrees F
Frost-free period—160 to 200 days

Typical Profile

0 to 10 inches—very dark brown loam
10 to 20 inches—very dark grayish brown loam
20 to 35 inches—dark brown sandy loam
35 to 60 inches—dark brown gravelly sandy loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 7.5 inches
Depth to water table: 48 to 72 inches in December through March

Contrasting Inclusions

- Camas, Newberg, and Evans soils on flood plains
- Chapman, Chehalis, and Roseburg soils on flood plains
- Soils that are similar to this Central Point soil but are poorly drained and are in concave positions
- Central Point soils that have a very gravelly surface layer

Major Uses

Cropland, pasture, and homesite development

Major Management Limitation

- Hazard of compaction

Use and Management

Cropland

- Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Leveling is needed in sloping areas.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risk of compaction of the surface layer by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.

36E—Chamate extremely gravelly loam, 3 to 30 percent slopes

Composition

Chamate soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Footslopes
Parent material: Colluvium derived from welded tuff
Elevation: 1,000 to 3,500 feet
Native plants: Douglas fir and incense cedar with an understory of whipplevine, creambush oceanspray, cascade Oregongrape, and mountain brome

Climatic factors:

Mean annual precipitation—50 to 60 inches
Mean annual air temperature—46 to 50 degrees F
Frost-free period—100 to 160 days

Typical Profile

0 to 7 inches—dark grayish brown extremely gravelly loam
7 to 56 inches—dark brown and brown very gravelly loam
56 to 65 inches—brown extremely gravelly loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Contrasting Inclusions

- Orford soils in concave positions
- Vena soils in convex, more steeply sloping positions
- Soils that are similar to this Chamate soil but are poorly drained
- Gustin soils in concave positions and near drainageways
- Areas of talus below Rock outcrop
- Soils that are similar to this Chamate soil but have less than 35 percent rock fragments
- Chamate soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

- High amount of rock fragments on the surface and in the soil
- Hazard of erosion
- Steepness of slope
- Plant competition
- Seedling mortality

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- When the soil is dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

36F—Chamate extremely gravelly loam, 30 to 60 percent slopes

Composition

Chamate soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Dominantly south-facing side slopes
Parent material: Colluvium derived from welded tuff
Elevation: 1,000 to 3,500 feet
Native plants: Douglas fir and incense cedar with an understory of whipplevine, creambush oceanspray, cascade Oregongrape, and mountain brome
Climatic factors:
Mean annual precipitation—50 to 60 inches
Mean annual air temperature—46 to 50 degrees F
Frost-free period—100 to 160 days

Typical Profile

0 to 7 inches—dark grayish brown extremely gravelly loam
7 to 56 inches—dark brown and brown very gravelly loam
56 to 65 inches—brown extremely gravelly loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Contrasting Inclusions

- Rock outcrop
- Areas of talus below Rock outcrop
- Orford soils in concave, less sloping positions
- Vena soils in convex, more steeply sloping positions
- Soils that are similar to this Chamate soil but have less than 35 percent rock fragments
- Chamate soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- High amount of rock fragments on the surface and in the soil
- Hazard of erosion

- Plant competition
- Seedling mortality

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Providing artificial shade or leaving some of the larger trees to provide shade on the south- and west-facing slopes, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

37A—Chapman-Chehalis complex, 0 to 3 percent slopes

Composition

Chapman soil and similar inclusions—50 percent
Chehalis soil and similar inclusions—25 percent
Contrasting inclusions—25 percent

Setting

Landform: Flood plains
Landscape position: Intermediate flood plains
Parent material: Mixed alluvium
Elevation: 100 to 1,600 feet
Native plants: Bigleaf maple and Oregon ash with an understory of common snowberry, mockorange, western hazel, and Kentucky bluegrass
Climatic factors:
Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Chapman Soil

Typical profile

0 to 25 inches—very dark grayish brown loam
25 to 40 inches—dark brown loam
40 to 60 inches—very dark grayish brown loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 10 inches
Frequency of flooding: Occasional in November through March

Chehalis Soil

Typical profile

0 to 16 inches—dark brown silt loam
16 to 47 inches—very dark grayish brown silty clay loam
47 to 60 inches—dark brown silty clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 11 inches
Frequency of flooding: Occasional in November through March

Contrasting Inclusions

- Camas, Newberg, and Evans soils on lower flood plains
- Roseburg and Sibold soils on higher flood plains

Major Uses

Cropland and pasture

Major Management Limitations

Chapman and Chehalis

- Hazard of flooding
- Hazard of compaction

Chehalis

- Low soil strength

Use and Management

Cropland

- Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Leveling is needed in sloping areas.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.

• Regulate the application of irrigation water to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
• Reduce the risk of erosion by providing structures along streambanks to control the flow of water and by planting cover crops.
• Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

38F—Chimneyrock very gravelly loam, 30 to 60 percent north slopes

Composition

Chimneyrock soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from conglomerate
Elevation: 900 to 2,500 feet
Native plants: Douglas fir and grand fir with an understory of cascade Oregongrape, American twinflower, western hazel, and Alaska oniongrass
Climatic factors:
Mean annual precipitation—40 to 50 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—120 to 200 days

Typical Profile

0 to 6 inches—dark brown very gravelly loam
6 to 24 inches—brown gravelly clay loam
24 to 47 inches—reddish brown extremely cobbly clay loam
47 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 6.5 inches

Contrasting Inclusions

• Hilltish, Josephine, and Speaker soils
• Windygap clay loam in concave, less sloping positions
• Chimneyrock soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

• Steepness of slope
• Hazard of erosion
• High amount of rock fragments on the surface and in the soil
• Hazard of slope failure
• Plant competition
• Seedling mortality

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

38G—Chimneyrock very gravelly loam, 60 to 90 percent north slopes

Composition

Chimneyrock soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from conglomerate
Elevation: 900 to 2,500 feet
Native plants: Douglas fir and grand fir with an understory of cascade Oregongrape, American twinflower, western hazel, and Alaska oniongrass
Climatic factors:
Mean annual precipitation—40 to 50 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—120 to 200 days

Typical Profile

0 to 6 inches—dark brown very gravelly loam
6 to 24 inches—brown gravelly clay loam
24 to 47 inches—reddish brown extremely cobbly clay loam
47 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 6.5 inches

Contrasting Inclusions

- Hilltish, Josephine, and Speaker soils
- Windygap clay loam in concave, less sloping positions
- Rock outcrop in convex, more steeply sloping positions
- Chimneyrock soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Plant competition
- Seedling mortality

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soil is dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

39F—Chimneyrock very gravelly loam, 30 to 60 percent south slopes

Composition

Chimneyrock soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from conglomerate
Elevation: 900 to 2,500 feet
Native plants: Douglas fir and ponderosa pine with an understory of canyon live oak, Pacific poison oak, whipplevine, and western fescue
Climatic factors:
Mean annual precipitation—40 to 50 inches

Mean annual air temperature—50 to 55 degrees F
Frost-free period—120 to 200 days

Typical Profile

0 to 6 inches—dark brown very gravelly loam
6 to 24 inches—brown gravelly clay loam
24 to 47 inches—reddish brown extremely cobbly clay loam
47 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 6.5 inches

Contrasting Inclusions

- Hilltish, Josephine, and Speaker soils
- Windygap clay loam in concave, less sloping positions
- Chimneyrock soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Seedling mortality
- Plant competition
- Hazard of fire damage

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.

39G—Chimneyrock very gravelly loam, 60 to 90 percent south slopes

Composition

Chimneyrock soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from conglomerate
Elevation: 900 to 2,500 feet
Native plants: Douglas fir and ponderosa pine with an understory of canyon live oak, Pacific poison oak, whipplevine, western fescue
Climatic factors:
Mean annual precipitation—40 to 50 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—120 to 200 days

Typical Profile

0 to 6 inches—dark brown very gravelly loam
6 to 24 inches—brown gravelly clay loam
24 to 47 inches—reddish brown extremely cobbly clay loam
47 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 6.5 inches

Contrasting Inclusions

- Hilltish, Josephine, and Speaker soils

• Windygap clay loam in concave, less sloping positions
• Rock outcrop in convex, more steeply sloping positions
• Chimneyrock soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

• Steepness of slope
• Hazard of erosion
• High amount of rock fragments on the surface and in the soil
• Hazard of slope failure
• Seedling mortality
• Plant competition
• Hazard of fire damage

Use and Management

Woodland

• Highlead or other cable logging systems are best suited to this unit.
• When the soil is dry, landings can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
• Headwall areas should be avoided when constructing roads.
• Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.

40F—Clevescove-Salander complex, 30 to 70 percent slopes

Composition

Clevescove soil and similar inclusions—50 percent
Salander soil and similar inclusions—35 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 20 to 800 feet
Native plants: Douglas fir and Sitka spruce with an understory of salal, evergreen huckleberry, salmonberry, and Pacific rhododendron
Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—51 to 53 degrees F
Frost-free period—180 to 240 days

Clevescove Soil

Typical profile

0 to 4 inches—black loam
4 to 15 inches—very dark brown loam
15 to 50 inches—very dark brown and very dark grayish brown gravelly loam
50 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 9.5 inches

Salander Soil

Typical profile

0 to 17 inches—very dark brown and dark reddish brown silt loam
17 to 53 inches—dark brown silt loam
53 to 61 inches—dark brown silty clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 18 inches

Contrasting Inclusions

• Millicoma and Reedsport soils in convex, more steeply sloping positions
• Soils that are similar to the Clevescove soil but have more than 35 percent rock fragments and are in convex, more steeply sloping positions
• Clevescove and Salander soils that have slopes of less than 30 percent
• Clevescove soils that have slopes of more than 70 percent

Major Use

Woodland

Major Management Limitations

• Steepness of slope
• Hazards of erosion and compaction
• Hazard of slope failure
• Plant competition

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• In the more steeply sloping areas of this unit, end hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Headwall areas should be avoided when constructing roads.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

41E—Climax clay, 12 to 30 percent slopes

Composition

Climax soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills
Landscape position: Footslopes
Parent material: Colluvium derived from basalt
Elevation: 400 to 2,000 feet
Native plants: Oregon white oak with an understory of Pacific poison oak, Saskatoon serviceberry, western buttercup, and California oatgrass
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 4 inches—black clay
4 to 36 inches—black clay
36 to 39 inches—olive brown clay
39 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Moderately well drained
Permeability: Very slow
Available water capacity: About 4 inches
Depth to water table: 18 to 36 inches in December through April
Shrink-swell potential: High

Contrasting Inclusions

• Curtin and Yoncalla soils in concave, less sloping positions
• Edenbower, Dixonville, and Philomath soils in convex, more steeply sloping positions
• Climax soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Hay and pasture, and homesite development

Major Management Limitations

• High shrink-swell potential
• Steepness of slope
• Very slow permeability
• Hazards of compaction and erosion
• Wetness
• Depth to rock

- High clay content
- Low soil strength

Use and Management

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- In many areas, it may be necessary to haul in topsoil for lawns and gardens.
- Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
- Interceptor ditches can be used to divert subsurface water away from the absorption field.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
- Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.
- Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
- Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.

41F—Climax clay, 30 to 60 percent slopes

Composition

Climax soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Colluvium derived from basalt
Elevation: 400 to 2,000 feet
Native plants: Oregon white oak with an understory of Pacific poison oak, Saskatoon serviceberry, western buttercup, and California oatgrass
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 4 inches—black clay
4 to 36 inches—black clay
36 to 39 inches—olive brown clay
39 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Moderately well drained
Permeability: Very slow
Available water capacity: About 4 inches
Depth to water table: 18 to 36 inches in December through April
Shrink-swell potential: High

Contrasting Inclusions

- Curtin and Yoncalla soils in concave, less sloping positions
- Edenbower, Dixonville, and Philomath soils in convex, more steeply sloping positions
- Climax soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Pasture

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction

- High shrink-swell potential
- Very slow permeability
- Wetness
- High clay content
- Depth to rock
- Low soil strength

Use and Management

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.
- Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

42B—Coburg silty clay loam, 0 to 5 percent slopes

Composition

Coburg soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Terraces
Landscape position: Low terraces
Parent material: Mixed alluvium
Elevation: 100 to 1,100 feet
Native plants: Bigleaf maple and Oregon ash with an understory of Himalaya blackberry, common snowberry, Pacific poison oak, and mountain brome
Climatic factors:
Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 10 inches—very dark grayish brown silty clay loam
10 to 27 inches—very dark grayish brown silty clay loam
27 to 41 inches—dark brown silty clay
41 to 63 inches—dark brown clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 18 to 30 inches in November through May
Permeability: Moderately slow
Available water capacity: About 11 inches

Contrasting Inclusions

- Banning and Foehlin soils
- Conser soils in concave positions
- Coburg soils on flood plains

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

- Hazard of compaction
- Wetness
- Moderately slow permeability
- Low soil strength

Use and Management

Cropland

- Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Leveling is needed in sloping areas.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- If a suitable outlet is available, tile drains can be used to divert subsurface water away from the absorption field.

• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Roads should be designed to offset the limited ability of the soil to support a load.
• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.

43A—Coburg silty clay loam, flooded, 0 to 3 percent slopes

Composition

Coburg soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Flood plains
Landscape position: High flood plains
Parent material: Mixed alluvium
Elevation: 100 to 1,100 feet
Native plants: Bigleaf maple and Oregon ash with an understory of Himalaya blackberry, common snowberry, Pacific poison oak, and mountain brome
Climatic factors:
Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 17 inches—very dark grayish brown silty clay loam
17 to 30 inches—dark brown silty clay loam
30 to 60 inches—brown silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 18 to 30 inches in November through May
Permeability: Moderately slow
Available water capacity: About 11 inches
Frequency of flooding: Occasional in December through March

Contrasting Inclusions

• Roseburg and Sibold soils
• Waldo soils in concave positions
• Coburg soils on terraces

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

• Hazard of flooding
• Hazard of compaction
• Wetness
• Moderately slow permeability
• Low soil strength

Use and Management

Cropland

• Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Leveling is needed in sloping areas.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
• Reduce the risk of erosion by providing structures along streambanks to control the flow of water and by planting cover crops.
• Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• If a suitable outlet is available, tile drains can be used to divert subsurface water away from the absorption field.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Roads should be designed to offset the limited ability of the soil to support a load.
• Reduce wetness by installing drain tile around

footings and providing drainage around buildings with basements and crawl spaces.
• Structures and roads should be located above the expected flood level.

44A—Conser silty clay loam, 0 to 3 percent slopes

Composition

Conser soil and similar inclusions—90 percent
Contrasting inclusions—10 percent

Setting

Landform: Terraces
Landscape position: Low terraces
Parent material: Clayey alluvium
Elevation: 100 to 1,300 feet
Native plants: Oregon white oak and Oregon ash with an understory of common snowberry, Pacific poison oak, rose, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 4 inches—very dark grayish brown silty clay loam
4 to 11 inches—very dark grayish brown clay
11 to 33 inches—dark gray clay
33 to 63 inches—gray clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Poorly drained
Depth to water table: 6 inches above the surface to a depth of 18 inches below the surface in November through May
Permeability: Slow
Available water capacity: About 10 inches
Shrink-swell potential: High

Contrasting Inclusions

• Sibold and Waldo soils on flood plains
• Coburg, Malabon, and Redbell soils on higher terraces

Major Uses

Hay (fig. 8) and pasture, homesite development, and wetland management

Major Management Limitations

• Wetness
• Hazard of compaction
• High shrink-swell potential
• Slow permeability
• High clay content
• Low soil strength

Use and Management

Hay and pasture

• Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Leveling is needed in sloping areas.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
• Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Select plants that can tolerate wetness.
• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• In many areas, it may be necessary to haul in topsoil for lawns and gardens.
• This soil generally is not suitable for septic tank absorption fields; however, areas of suitable included soils may be in the unit. Onsite investigation is needed to locate these areas.
• Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
• Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.

Figure 8.—Hay in an area of Conser silty clay loam, 0 to 3 percent slopes. Nonpareil-Oakland complex, 30 to 60 percent slopes, in background.

45A—Coquille silt loam, 0 to 1 percent slopes

Composition

Coquille soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Flood plains and stream deltas that are subject to tidal fluctuations
Landscape position: Low flood plains
Parent material: Mixed alluvium over marine sediment
Elevation: 0 to 10 feet
Native plants: Sitka spruce, red alder, slough sedge, cattails, and tufted hairgrass
Climatic factors:
Mean annual precipitation—70 to 90 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—180 to 240 days

Typical Profile

0 to 13 inches—dark grayish brown silt loam
13 to 36 inches—dark gray silt loam
36 to 48 inches—very dark gray silt loam
48 to 60 inches—very dark gray silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Very poorly drained
Depth to water table: 24 inches above the surface to a depth of 24 inches below the surface in January through December
Permeability: Slow
Available water capacity: About 11 inches
Frequency of flooding: Frequent in January through December

Contrasting Inclusions

- Willanch soils
- Nestucca soils on higher flood plains
- Lint soils on terraces
- Bragton soils on lower flood plains

Major Uses

Wildlife habitat, hay and pasture, and wetland management

Major Management Limitations

- Hazard of flooding
- Wetness
- Hazard of compaction

- Slow permeability
- Low soil strength

Use and Management

Hay and pasture

- Protection from flooding can be provided only by use of extensive dikes.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate wetness.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

46A—Coquille silt loam, protected, 0 to 1 percent slopes

Composition

Coquille soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Flood plains and stream deltas protected from tidal flooding by dikes
Landscape position: Low flood plains
Parent material: Mixed alluvium over marine sediment
Elevation: 0 to 10 feet
Native plants: Sitka spruce, red alder, slough sedge, cattails, and tufted hairgrass
Climatic factors:
Mean annual precipitation—70 to 90 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—180 to 240 days

Typical Profile

0 to 13 inches—dark grayish brown silt loam
13 to 36 inches—dark gray silt loam
36 to 48 inches—very dark gray silt loam
48 to 60 inches—very dark gray silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Very poorly drained
Depth to water table: 6 inches above the surface to a depth of 24 inches below the surface in October through June
Permeability: Slow
Available water capacity: About 11 inches
Frequency of flooding: Rare

Contrasting Inclusions

- Willanch soils
- Nestucca soils on higher flood plains
- Lint soils on terraces
- Bragton soils on lower flood plains

Major Uses

Hay and pasture, wildlife habitat, and wetland management

Major Management Limitations

- Wetness
- Hazard of flooding
- Hazard of compaction
- Slow permeability
- Low soil strength

Use and Management

Hay and pasture

- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate wetness.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

47E—Crater Lake sandy loam, 3 to 30 percent slopes

Composition

Crater Lake soil and similar inclusions—95 percent
Contrasting inclusions—5 percent

Setting

Landform: Mountains
Landscape position: High terraces and side slopes
Parent material: Volcanic ash
Elevation: 1,000 to 1,800 feet
Native plants: Douglas fir and grand fir with an understory of salal, cascade Oregongrape, golden chinkapin, and western swordfern
Climatic factors:
Mean annual precipitation—40 to 50 inches

Mean annual air temperature—47 to 50 degrees F
Frost-free period—120 to 160 days

Typical Profile

0 to 3 inches—very dark grayish brown sandy loam
3 to 24 inches—dark yellowish brown sandy loam
24 to 60 inches—dark yellowish brown and yellowish brown sandy loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 12.5 inches

Contrasting Inclusions

- Zing soils in concave positions and near drainageways
- Soils that are similar to this Crater Lake soil but are poorly drained and are in concave positions and near drainageways
- Glide soils on flood plains
- Crater Lake soils that have slopes of more than 30 percent

Major Uses

Woodland, and hay and pasture

Major Management Limitations

- Hazards of compaction and erosion
- Plant competition
- Steepness of slope

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Hay and pasture

- Sprinkler and trickle irrigation systems are suited to the less sloping areas of this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

47F—Crater Lake sandy loam, 30 to 60 percent slopes

Composition

Crater Lake soil and similar inclusions—90 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Volcanic ash
Elevation: 1,000 to 1,800 feet
Native plants: Douglas fir and grand fir with an understory of salal, cascade Oregongrape, golden chinkapin, and western swordfern
Climatic factors:
Mean annual precipitation—40 to 50 inches
Mean annual air temperature—47 to 50 degrees F
Frost-free period—120 to 160 days

Typical Profile

0 to 3 inches—very dark grayish brown sandy loam
3 to 24 inches—dark yellowish brown sandy loam
24 to 60 inches—dark yellowish brown and yellowish brown sandy loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more

Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 12.5 inches

Contrasting Inclusions

- Zing soils in concave, less sloping positions
- Soils that are similar to this Crater Lake soil but are poorly drained and are in concave, less sloping positions
- Crater Lake soils that have slopes of less than 30 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

48C—Curtin clay, 3 to 12 percent slopes

Composition

Curtin soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Alluvial fans
Parent material: Clayey alluvium
Elevation: 400 to 2,000 feet
Native plants: Oregon white oak and Oregon ash with an understory of Pacific poison oak, Saskatoon serviceberry, western buttercup, and California oatgrass
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 21 inches—black clay
21 to 60 inches—very dark grayish brown clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 6 to 18 inches in December through April
Permeability: Very slow
Available water capacity: About 9 inches
Shrink-swell potential: High

Contrasting Inclusions

- Yoncalla soils
- Climax, Dixonville, and Philomath soils in convex, more steeply sloping positions
- Bashaw soils in concave, less sloping positions
- Curtin soils that have slopes of more than 12 percent

Major Uses

Hay and pasture, and homesite development

Major Management Limitations

- High shrink-swell potential
- Very slow permeability
- Wetness
- Hazards of compaction and erosion
- High clay content
- Low soil strength

Use and Management

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate wetness.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.

• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• In many areas, it may be necessary to haul in topsoil for lawns and gardens.
• Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
• If a suitable outlet is available, tile drains can be used to divert subsurface water away from the absorption field.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
• Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• Seed cuts and fills to permanent vegetation.
• Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.

48D—Curtin clay, 12 to 20 percent slopes

Composition

Curtin soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Alluvial fans and footslopes
Parent material: Clayey alluvium and colluvium derived from basalt
Elevation: 400 to 2,000 feet
Native plants: Oregon white oak and Oregon ash with an understory of Pacific poison oak, Saskatoon serviceberry, western buttercup, and California oatgrass
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 21 inches—black clay
21 to 60 inches—very dark grayish brown clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 6 to 18 inches in December through April
Permeability: Very slow
Available water capacity: About 9 inches
Shrink-swell potential: High

Contrasting Inclusions

• Yoncalla soils
• Climax, Dixonville, and Philomath soils in convex, more steeply sloping positions
• Curtin soils that have slopes of less than 12 percent or more than 20 percent

Major Uses

Hay and pasture, and homesite development

Major Management Limitations

• High shrink-swell potential
• Very slow permeability
• Wetness
• Steepness of slope
• Hazards of compaction and erosion
• Hazard of slope failure
• High clay content
• Low soil strength

Use and Management

Hay and pasture

• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Select plants that can tolerate wetness.
• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Tillage and seeding should be done on the contour or across the slope where practical.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.

• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• In many areas, it may be necessary to haul in topsoil for lawns and gardens.
• Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
• Interceptor ditches can be used to divert subsurface water away from the absorption field.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
• Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.
• Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.

49F—Damewood-Bohannon-Umpcoos complex, 30 to 60 percent slopes

Composition

Damewood soil and similar inclusions—30 percent
Bohannon soil and similar inclusions—25 percent
Umpcoos soil and similar inclusions—25 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes and ridges
Parent material: Colluvium derived from sandstone
Elevation: 200 to 2,200 feet
Native plants: Damewood and Bohannon—Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple; Umpcoos—Douglas fir and Pacific madrone with an understory of cascade Oregongrape, common beargrass, whipplevine, and Alaska oniongrass
Climatic factors:
Mean annual precipitation—70 to 110 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Damewood Soil

Typical profile

0 to 11 inches—very dark brown very gravelly loam
11 to 29 inches—dark brown extremely gravelly loam
29 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Bohannon Soil

Typical profile

0 to 12 inches—very dark brown and very dark grayish brown gravelly loam
12 to 32 inches—dark brown and dark yellowish brown gravelly loam
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 4 inches

Umpcoos Soil

Typical profile

0 to 4 inches—dark brown very gravelly sandy loam
4 to 17 inches—dark brown very gravelly sandy loam
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 1 inch

Contrasting Inclusions

• Rock outcrop in convex, more steeply sloping positions
• Soils below areas of Rock outcrop that have an extremely gravelly or extremely cobbly surface layer
• Soils that are similar to the Damewood soil but have bedrock at a depth of more than 40 inches

• Blachly, Preacher, and Xanadu soils in concave, less sloping positions
• Damewood and Bohannon soils that have slopes of less than 30 percent
• Damewood, Bohannon, and Umpcoos soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Damewood, Bohannon, and Umpcoos

• Steepness of slope
• Hazard of erosion
• Plant competition
• Depth to rock

Damewood and Umpcoos

• High amount of rock fragments on the surface and in the soil
• Seedling mortality

Bohannon

• Hazard of compaction

Umpcoos

• Hazard of windthrow

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees on the Umpcoos soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

49G—Damewood-Bohannon-Umpcoos complex, 60 to 90 percent slopes

Composition

Damewood soil and similar inclusions—30 percent
Bohannon soil and similar inclusions—25 percent
Umpcoos soil and similar inclusions—25 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Damewood and Bohannon—side slopes; Umpcoos—side slopes and headwalls
Parent material: Colluvium derived from sandstone
Elevation: 200 to 2,200 feet
Native plants: Damewood and Bohannon—Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple; Umpcoos—Douglas fir and Pacific madrone with an understory of cascade Oregongrape, common beargrass, whipplevine, and Alaska oniongrass
Climatic factors:
Mean annual precipitation—70 to 110 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Damewood Soil

Typical profile

0 to 11 inches—very dark brown very gravelly loam
11 to 29 inches—dark brown extremely gravelly loam
29 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Bohannon Soil

Typical profile

0 to 12 inches—very dark brown and very dark grayish brown gravelly loam

12 to 32 inches—dark brown and dark yellowish brown gravelly loam
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 4 inches

Umpcoos Soil

Typical profile

0 to 4 inches—dark brown very gravelly sandy loam
4 to 17 inches—dark brown very gravelly sandy loam
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 1 inch

Contrasting Inclusions

- Rock outcrop in convex positions
- Soils that are similar to the Damewood soil but have an extremely gravelly or extremely cobbly surface layer and are below areas of Rock outcrop
- Soils that are similar to the Damewood soil but have bedrock at a depth of more than 40 inches
- Preacher soils in concave, less sloping positions
- Damewood, Bohannon, and Umpcoos soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Damewood, Bohannon, and Umpcoos

- Steepness of slope
- Hazard of erosion
- Hazard of slope failure
- Plant competition
- Depth to rock

Damewood and Umpcoos

- High amount of rock fragments on the surface and in the soil
- Seedling mortality

Bohannon

- Hazard of compaction

Umpcoos

- Hazard of windthrow

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Umpcoos soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

50E—Darby silty clay loam, 12 to 30 percent slopes

Composition

Darby soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Footslopes
Parent material: Colluvium and residuum derived from basalt
Elevation: 400 to 2,600 feet
Native plants: Douglas fir and grand fir with an

understory of salal, western swordfern, cascade Oregongrape, and whipplevine

Climatic factors:

Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 10 inches—very dark brown silty clay loam
10 to 44 inches—very dark brown silty clay
44 to 61 inches—dark yellowish brown silty clay loam
61 inches—soft bedrock

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Climax soils
- Dixonville and Philomath soils in convex, more steeply sloping positions
- Curtin and Yoncalla soils in concave, less sloping positions
- Darby soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Hay and pasture, woodland, and homesite development

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Plant competition
- Slow permeability
- High shrink-swell potential
- Low soil strength

Use and Management

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
- Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

50F—Darby silty clay loam, 30 to 60 percent slopes

Composition

Darby soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from basalt
Elevation: 400 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 10 inches—very dark brown silty clay loam
10 to 44 inches—very dark brown silty clay
44 to 61 inches—dark yellowish brown silty clay loam
61 inches—soft bedrock

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Dixonville soils in convex positions
- Ritner and Philomath soils in convex, more steeply sloping positions
- Climax soils in concave positions
- Curtin and Yoncalla soils in concave, less sloping positions
- Darby soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Slow permeability
- High shrink-swell potential
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

51C—Debenger-Brader complex, 2 to 12 percent slopes

Composition

Debenger soil and similar inclusions—50 percent
Brader soil and similar inclusions—30 percent
Contrasting inclusions—20 percent

Setting

Landform: Hills
Landscape position: Toeslopes and ridges
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 700 to 1,600 feet
Native plants: Debenger—Oregon white oak and Pacific madrone with an understory of Pacific poison oak, common snowberry, Saskatoon serviceberry, and Idaho fescue; Brader—Oregon white oak and California black oak with an understory of Pacific poison oak, hairy honeysuckle, pine bluegrass, and Idaho fescue
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—52 to 54 degrees F
Frost-free period—160 to 200 days

Debenger Soil

Typical profile

0 to 11 inches—dark yellowish brown and brown loam
11 to 26 inches—brown loam
26 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5 inches

Brader Soil

Typical profile

0 to 2 inches—dark brown loam
2 to 12 inches—brown loam
12 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 12 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2 inches

Contrasting Inclusions

- Sutherlin and Veneta soils in concave positions
- Conser, Panther, and Redbell soils in concave positions and near drainageways
- Rock outcrop in convex positions
- Soils that are similar to the Debenger soil but are poorly drained and are in concave positions and near drainageways
- Debenger and Brader soils that have slopes of more than 12 percent

Major Uses

Pasture and homesite development

Major Management Limitations

Debenger and Brader

- Hazards of compaction and erosion
- Depth to rock

Brader

- Droughtiness

Use and Management

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- In many areas, it may be necessary to haul in topsoil for lawns and gardens.
- Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock. Onsite investigation is needed to locate these areas.
- Seed cuts and fills to permanent vegetation.

51E—Debenger-Brader complex, 12 to 30 percent slopes

Composition

Debenger soil and similar inclusions—50 percent
Brader soil and similar inclusions—30 percent
Contrasting inclusions—20 percent

Setting

Landform: Hills
Landscape position: Footslopes and ridges
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 700 to 1,600 feet
Native plants: Debenger—Oregon white oak and Pacific madrone with an understory of Pacific poison oak, common snowberry, Saskatoon serviceberry, and Idaho fescue; Brader—Oregon white oak and California black oak with an understory of Pacific poison oak, hairy honeysuckle, pine bluegrass, and Idaho fescue
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—52 to 54 degrees F
Frost-free period—160 to 200 days

Debenger Soil

Typical profile

0 to 11 inches—dark yellowish brown and brown loam
11 to 26 inches—brown loam
26 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5 inches

Brader Soil

Typical profile

0 to 2 inches—dark brown loam
2 to 12 inches—brown loam
12 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 12 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2 inches

Contrasting Inclusions

- Sutherlin and Veneta soils in concave positions
- Rock outcrop in convex positions
- Panther soils in concave positions and near drainageways
- Soils that are similar to the Debenger soil but are poorly drained and are in concave positions and near drainageways
- Debenger and Brader soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Pasture and homesite development

Major Management Limitations

Debenger and Brader

- Hazards of erosion and compaction
- Steepness of slope
- Depth to rock

Brader

- Droughtiness

Use and Management

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- In many areas, it may be necessary to haul in topsoil for lawns and gardens.
- Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock. Onsite investigation is needed to locate these areas.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

51F—Debenger-Brader complex, 30 to 60 percent slopes

Composition

Debenger soil and similar inclusions—50 percent
Brader soil and similar inclusions—30 percent
Contrasting inclusions—20 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 700 to 1,600 feet
Native plants: Debenger—Oregon white oak and Pacific madrone with an understory of Pacific poison oak, common snowberry, Saskatoon serviceberry, and Idaho fescue; Brader—Oregon white oak and California black oak with an understory of Pacific poison oak, hairy honeysuckle, pine bluegrass, and Idaho fescue
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—52 to 54 degrees F
Frost-free period—160 to 200 days

Debenger Soil

Typical profile

0 to 11 inches—dark yellowish brown and brown loam
11 to 26 inches—brown loam
26 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained

Permeability: Moderate
Available water capacity: About 5 inches

Brader Soil

Typical profile

0 to 2 inches—dark brown loam
2 to 12 inches—brown loam
12 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 12 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2 inches

Contrasting Inclusions

- Hilltish soils derived from conglomerate
- Sutherlin soils in concave, less sloping positions
- Rock outcrop in convex positions
- Soils that are similar to the Debenger soil but have more than 35 percent rock fragments and are in convex, more steeply sloping positions
- Soils that are similar to the Debenger soil but have bedrock at a depth of more than 40 inches
- Debenger and Brader soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Livestock grazing

Major Management Limitations

Debenger and Brader

- Steepness of slope
- Hazards of erosion and compaction
- Depth to rock

Brader

- Droughtiness

Use and Management

Livestock grazing

- Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
- Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
- Brush management and seeding reduce competition from woody plants and improve degraded areas.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.
- Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

52G—Dicecreek-Bellpine-Windygap complex, 30 to 60 percent south slopes

Composition

Dicecreek soil and similar inclusions—40 percent
Bellpine soil and similar inclusions—35 percent
Windygap soil and similar inclusions—15 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Dicecreek and Bellpine—convex side slopes; Windygap—concave side slopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 800 to 2,200 feet
Native plants: Douglas fir and incense cedar with an understory of tall Oregongrape, western hazel, creambush oceanspray, and California fescue
Climatic factors:
Mean annual precipitation—40 to 50 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—140 to 200 days

Dicecreek Soil

Typical profile

0 to 3 inches—dark brown loam
3 to 12 inches—dark brown gravelly silty clay loam
12 inches—hard bedrock

Properties and qualities

Depth to hard, fractured bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2.5 inches

Bellpine Soil

Typical profile

0 to 3 inches—dark brown clay loam
3 to 18 inches—brown clay loam
18 to 25 inches—strong brown clay
25 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5 inches

Windygap Soil

Typical profile

0 to 4 inches—dark brown clay loam
4 to 7 inches—reddish brown clay loam
7 to 16 inches—yellowish red clay
16 to 58 inches—red silty clay
58 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8.5 inches

Contrasting Inclusions

- Atring, McGinnis, and Tishar soils in convex, more steeply sloping positions
- Vermisa soils in convex, more steeply sloping positions
- Dicecreek, Bellpine, and Windygap soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Dicecreek, Bellpine, and Windygap

- Steepness of slope
- Hazards of erosion and compaction
- Seedling mortality
- Plant competition
- Low soil strength

Dicecreek

- Depth to rock
- Hazard of fire damage
- Hazard of windthrow

Bellpine

- Moderately slow permeability
- Depth to rock
- Hazard of windthrow

Windygap

- Hazard of slope failure
- Moderately slow permeability

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Dicecreek soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- The Windygap soil is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Slumping on the Windygap soil can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- In areas of the Dicecreek soil, increased erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees on the Dicereek and Bellpine soils commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

53E—Dickerson loam, 3 to 30 percent slopes

Composition

Dickerson soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills
Landscape position: Ridges and side slopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 500 to 2,500 feet
Native plants: Pine bluegrass, blue wildrye, western buttercup, and western yarrow
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 2 inches—dark yellowish brown loam
2 to 5 inches—dark brown loam
5 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 5 to 10 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 1 inch

Contrasting Inclusions

• Nonpareil, Oakland, and Speaker soils
• Windygap and Rosehaven soils in concave positions
• Atring soils in convex, more steeply sloping positions
• Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways
• Rock outcrop in convex positions
• Dickerson soils that have slopes of more than 30 percent

Major Use

Livestock grazing

Major Management Limitations

• Depth to rock
• Hazards of compaction and erosion
• Steepness of slope
• Droughtiness

Use and Management

Livestock grazing

• Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
• Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
• Brush management and seeding reduce competition from woody plants and improve degraded areas.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

53G—Dickerson loam, 30 to 90 percent slopes

Composition

Dickerson soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 500 to 2,500 feet
Native plants: Pine bluegrass, blue wildrye, western buttercup, and western yarrow
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 2 inches—dark yellowish brown loam
2 to 5 inches—dark brown loam
5 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 5 to 10 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 1 inch

Contrasting Inclusions

• Nonpareil, Oakland, and Speaker soils
• Windygap and Rosehaven soils in concave, less sloping positions
• Atring soils in convex, more steeply sloping positions
• Dupee and Sutherlin soils in concave, less sloping positions
• Rock outcrop in convex positions
• Dickerson soils that have slopes of less than 30 percent or more than 90 percent

Major Use

Livestock grazing

Major Management Limitations

- Steepness of slope
- Depth to rock
- Hazards of erosion and compaction
- Droughtiness

Use and Management

Livestock grazing

- Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
- Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
- Brush management and seeding reduce competition from woody plants and improve degraded areas.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.
- Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

54E—Dickerson-Rock outcrop complex, 3 to 30 percent slopes

Composition

Dickerson soil and similar inclusions—45 percent
Rock outcrop—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Ridges and side slopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 500 to 2,500 feet
Native plants: Pine bluegrass, blue wildrye, western buttercup, and western yarrow
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Dickerson Soil

Typical profile

0 to 2 inches—dark yellowish brown loam
2 to 5 inches—dark brown loam
5 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 5 to 10 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 1 inch

Rock Outcrop

Description: Areas of exposed bedrock

Contrasting Inclusions

- Nonpareil, Oakland, and Speaker soils
- Windygap and Rosehaven soils in concave positions
- Atring soils in convex, more steeply sloping positions
- Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways
- Dickerson soils that have slopes of more than 30 percent

Major Use

Livestock grazing

Major Management Limitations

- Areas of Rock outcrop
- Depth to rock
- Hazards of compaction and erosion
- Steepness of slope
- Droughtiness

Use and Management

Livestock grazing

- Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
- Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
- Brush management and seeding reduce competition from woody plants and improve degraded areas.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

54G—Dickerson-Rock outcrop complex, 30 to 90 percent slopes

Composition

Dickerson soil and similar inclusions—40 percent
Rock outcrop—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills

Landscape position: Side slopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 500 to 2,500 feet
Native plants: Pine bluegrass, blue wildrye, western buttercup, and western yarrow
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Dickerson Soil

Typical profile

0 to 2 inches—dark yellowish brown loam
2 to 5 inches—dark brown loam
5 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 5 to 10 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 1 inch

Rock Outcrop

Description: Areas of exposed bedrock

Contrasting Inclusions

- Nonpareil, Oakland, and Speaker soils
- Windygap and Rosehaven soils in concave, less sloping positions
- Atring soils in convex, more steeply sloping positions
- Dupee and Sutherlin soils in concave, less sloping positions
- Dickerson soils that have slopes of less than 30 percent or more than 90 percent

Major Use

Livestock grazing

Major Management Limitations

- Areas of Rock outcrop
- Steepness of slope
- Depth to rock
- Hazards of erosion and compaction
- Droughtiness

Use and Management

Livestock grazing

- Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
- Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
- Brush management and seeding reduce competition from woody plants and improve degraded areas.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.
- Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

55G—Dickerson-Rock outcrop-Chimneyrock complex, 60 to 90 percent north slopes

Composition

Dickerson soil and similar inclusions—30 percent
Rock outcrop—30 percent
Chimneyrock soil and similar inclusions—25 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Dickerson and Rock outcrop—side slopes and headwalls; Chimneyrock—concave side slopes
Parent material: Colluvium derived from conglomerate
Elevation: 1,000 to 2,000 feet
Native plants: Dickerson—pine bluegrass, blue wildrye, western buttercup, and western yarrow; Chimneyrock—Douglas fir and grand fir with an understory of cascade Oregongrape, American twinflower, western hazel, and Alaska oniongrass
Climatic factors:
Mean annual precipitation—45 to 50 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—120 to 200 days

Dickerson Soil

Typical profile

0 to 2 inches—dark yellowish brown loam
2 to 5 inches—dark brown loam
5 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 5 to 10 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 1 inch

Rock Outcrop

Description: Areas of exposed bedrock

Chimneyrock Soil

Typical profile

0 to 6 inches—dark brown very gravelly loam
6 to 24 inches—brown gravelly clay loam
24 to 47 inches—reddish brown extremely cobbly clay loam
47 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 6.5 inches

Contrasting Inclusions

- Hilltish, Josephine, and Speaker soils
- Windygap soils in concave, less sloping positions
- Dickerson and Chimneyrock soils that have slopes of less than 60 percent or more than 90 percent

Major Uses

Woodland and livestock grazing

Major Management Limitations

Map unit

- Areas of Rock outcrop

Dickerson and Chimneyrock

- Steepness of slope
- Hazard of erosion

Dickerson

- Depth to rock
- Hazard of compaction
- Droughtiness

Chimneyrock

- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Plant competition
- Seedling mortality

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soils are dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed rock fragments and fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- Avoiding areas with a high amount of Rock outcrop will minimize breakage of timber and increase the efficiency of yarding operations.
- The Chimneyrock soil is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

Livestock grazing

- Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
- Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
- Brush management and seeding reduce competition from woody plants and improve degraded areas.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.
- Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

56G—Dickerson-Rock outcrop-Chimneyrock complex, 60 to 90 percent south slopes

Composition

Dickerson soil and similar inclusions—30 percent
Rock outcrop—30 percent
Chimneyrock soil and similar inclusions—25 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Dickerson and Rock outcrop—side slopes and headwalls; Chimneyrock—concave side slopes
Parent material: Colluvium derived from conglomerate
Elevation: 1,000 to 2,000 feet
Native plants: Dickerson—pine bluegrass, blue wildrye, western buttercup, and western yarrow; Chimneyrock—Douglas fir and grand fir with an understory of cascade Oregongrape, American twinflower, western hazel, and Alaska oniongrass
Climatic factors:
Mean annual precipitation—45 to 50 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—120 to 200 days

Dickerson Soil

Typical profile

0 to 2 inches—dark yellowish brown loam
2 to 5 inches—dark brown loam
5 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 5 to 10 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 1 inch

Rock Outcrop

Description: Areas of exposed bedrock

Chimneyrock Soil

Typical profile

0 to 6 inches—dark brown very gravelly loam
6 to 24 inches—brown gravelly clay loam
24 to 47 inches—reddish brown extremely cobbly clay loam
47 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 6.5 inches

Contrasting Inclusions

- Hilltish, Josephine, and Speaker soils
- Windygap soils in concave, less sloping positions
- Dickerson and Chimneyrock soils that have slopes of less than 60 percent or more than 90 percent

Major Uses

Woodland and livestock grazing

Major Management Limitations

Map unit

- Areas of Rock outcrop

Dickerson and Chimneyrock

- Steepness of slope
- Hazard of erosion

Dickerson

- Depth to rock
- Hazard of compaction
- Droughtiness

Chimneyrock

- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Seedling mortality
- Plant competition
- Hazard of fire damage

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soils are dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed rock fragments and fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- Avoiding areas with a high amount of Rock outcrop will minimize breakage of timber and increase the efficiency of yarding operations.
- The Chimneyrock soil is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or planting a greater number of trees in a specified area,

and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• On the Chimneyrock soil, an increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.

Livestock grazing

• Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
• Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
• Brush management and seeding reduce competition from woody plants and improve degraded areas.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.
• Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

57E—Digger-Bohannon complex, 3 to 30 percent slopes

Composition

Digger soil and similar inclusions—40 percent
Bohannon soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Ridges and side slopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 100 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Digger Soil

Typical profile

0 to 6 inches—very dark grayish brown very gravelly loam
6 to 19 inches—dark brown very gravelly loam
19 to 28 inches—dark brown very gravelly loam
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Bohannon Soil

Typical profile

0 to 12 inches—very dark brown and very dark grayish brown gravelly loam
12 to 32 inches—dark brown and dark yellowish brown gravelly loam
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 4 inches

Contrasting Inclusions

• Fernhaven and Preacher soils in concave positions
• Honeygrove, Orford, and Xanadu soils in concave positions
• Soils that are similar to the Digger and Bohannon soils but are poorly drained and are in concave positions and near drainageways
• Soils that are similar to the Digger soil but have bedrock at a depth of more than 40 inches
• Digger and Bohannon soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Digger and Bohannon

• Hazards of compaction and erosion
• Plant competition
• Steepness of slope
• Hazard of windthrow
• Depth to rock

Digger

• High amount of rock fragments on the surface and in the soil
• Seedling mortality

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on the Digger soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

57F—Digger-Bohannon complex, 30 to 60 percent slopes

Composition

Digger soil and similar inclusions—40 percent
Bohannon soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes and ridges
Parent material: Colluvium and residuum derived from sandstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 100 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Digger Soil

Typical profile

0 to 6 inches—very dark grayish brown very gravelly loam
6 to 19 inches—dark brown very gravelly loam
19 to 28 inches—dark brown very gravelly loam
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Bohannon Soil

Typical profile

0 to 12 inches—very dark brown and very dark grayish brown gravelly loam
12 to 32 inches—dark brown and dark yellowish brown gravelly loam
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 4 inches

Contrasting Inclusions

• Fernhaven, Honeygrove, Orford, Preacher, and Xanadu soils in concave, less sloping positions
• Umpcoos soils in convex, more steeply sloping positions
• Soils that are similar to the Digger soil but have bedrock at a depth of more than 40 inches
• Digger and Bohannon soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Digger and Bohannon

• Steepness of slope

- Hazard of erosion
- Plant competition
- Hazard of windthrow
- Depth to rock

Digger

- High amount of rock fragments on the surface and in the soil
- Seedling mortality

Bohannon

- Hazard of compaction

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

58G—Digger-Bohannon-Umpcoos complex, 60 to 90 percent slopes

Composition

Digger soil and similar inclusions—30 percent
Bohannon soil and similar inclusions—25 percent
Umpcoos soil and similar inclusions—25 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Digger and Bohannon—side slopes; Umpcoos—side slopes and headwalls
Parent material: Colluvium derived from sandstone
Elevation: 200 to 3,000 feet
Native plants: Digger and Bohannon—Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple; Umpcoos—Douglas fir and Pacific madrone with an understory of cascade Oregongrape, common beargrass, whipplevine, and Alaska oniongrass
Climatic factors:
Mean annual precipitation—55 to 100 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Digger Soil

Typical profile

0 to 6 inches—very dark grayish brown very gravelly loam
6 to 19 inches—dark brown very gravelly loam
19 to 28 inches—dark brown very gravelly loam
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Bohannon Soil

Typical profile

0 to 12 inches—very dark brown and very dark grayish brown gravelly loam
12 to 32 inches—dark brown and dark yellowish brown gravelly loam
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 4 inches

Umpcoos Soil

Typical profile

0 to 4 inches—dark brown very gravelly sandy loam

4 to 17 inches—dark brown very gravelly sandy loam
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 1 inch

Contrasting Inclusions

- Rock outcrop in convex, more steeply sloping positions
- Soils that have an extremely gravelly or extremely cobbly surface layer and are below areas of Rock outcrop
- Soils that are similar to the Digger soil but have bedrock at a depth of more than 40 inches
- Digger, Bohannon, and Umpcoos soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Digger, Bohannon, and Umpcoos

- Steepness of slope
- Hazard of erosion
- Hazard of slope failure
- Plant competition
- Depth to rock

Digger and Umpcoos

- High amount of rock fragments on the surface and in the soil
- Seedling mortality

Bohannon

- Hazard of compaction

Umpcoos

- Hazard of windthrow

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on the Digger and Umpcoos soils do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Umpcoos soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

59G—Digger-Preacher complex, 60 to 90 percent slopes

Composition

Digger soil and similar inclusions—40 percent
Preacher soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Digger—convex side slopes; Preacher—concave side slopes
Parent material: Colluvium derived from sandstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 100 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Digger Soil

Typical profile

0 to 6 inches—very dark grayish brown very gravelly loam
6 to 19 inches—dark brown very gravelly loam

19 to 28 inches—dark brown very gravelly loam
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Preacher Soil

Typical profile

0 to 10 inches—dark brown loam
10 to 19 inches—dark brown loam
19 to 34 inches—brown loam
34 to 60 inches—brown clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 10.5 inches

Contrasting Inclusions

- Bohannon soils
- Umpcoos soils in convex, more steeply sloping positions
- Soils that are similar to the Digger soil but have bedrock at a depth of more than 40 inches
- Digger and Preacher soils that have slopes of less than 60 percent
- Digger soils that have slopes of more than 90 percent

Major Use

Woodland

Major Management Limitations

Digger and Preacher

- Steepness of slope
- Hazard of erosion
- Hazard of slope failure
- Plant competition

Digger

- High amount of rock fragments on the surface and in the soil
- Seedling mortality
- Hazard of windthrow
- Depth to rock

Preacher

- Hazard of compaction

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
- Roadcuts on the Digger soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction on the Preacher soil, use suitable logging systems and harvest timber when the soil is least susceptible to compaction.
- When the soils are dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Digger soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

60F—Digger-Umpcoos-Rock outcrop complex, 30 to 60 percent slopes

Composition

Digger soil and similar inclusions—30 percent
Umpcoos soil and similar inclusions—25 percent
Rock outcrop—25 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Digger and Umpcoos—side slopes and ridges; Rock outcrop—side slopes
Parent material: Colluvium derived from sandstone
Elevation: 200 to 3,000 feet

Native plants: Digger—Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple; Umpcoos—Douglas fir and Pacific madrone with an understory of cascade Oregongrape, common beargrass, whipplevine, and Alaska oniongrass

Climatic factors:
Mean annual precipitation—55 to 100 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Digger Soil

Typical profile

0 to 6 inches—very dark grayish brown very gravelly loam
6 to 19 inches—dark brown very gravelly loam
19 to 28 inches—dark brown very gravelly loam
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Umpcoos Soil

Typical profile

0 to 4 inches—dark brown very gravelly sandy loam
4 to 17 inches—dark brown very gravelly sandy loam
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 1 inch

Rock Outcrop

Description: Areas of exposed bedrock

Contrasting Inclusions

- Bohannon soils
- Fernhaven and Preacher soils in concave, less sloping positions
- Soils that are similar to the Digger soil but have bedrock at a depth of more than 40 inches
- Digger soils that have slopes of less than 30 percent
- Digger and Umpcoos soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Map unit

- Areas of Rock outcrop

Digger and Umpcoos

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Plant competition
- Seedling mortality
- Depth to rock

Umpcoos

- Hazard of windthrow

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Avoiding areas with a high amount of Rock outcrop will minimize breakage of timber and increase the efficiency of yarding operations.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Umpcoos soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

60G—Digger-Umpcoos-Rock outcrop complex, 60 to 90 percent slopes

Composition

Digger soil and similar inclusions—30 percent
Umpcoos soil and similar inclusions—25 percent
Rock outcrop—25 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Digger—side slopes; Umpcoos and Rock outcrop—side slopes and headwalls
Parent material: Colluvium derived from sandstone
Elevation: 200 to 3,000 feet
Native plants: Digger—Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple; Umpcoos—Douglas fir and Pacific madrone with an understory of cascade Oregongrape, common beargrass, whipplevine, and Alaska oniongrass
Climatic factors:
Mean annual precipitation—55 to 100 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Digger Soil

Typical profile

0 to 6 inches—very dark grayish brown very gravelly loam
6 to 19 inches—dark brown very gravelly loam
19 to 28 inches—dark brown very gravelly loam
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Umpcoos Soil

Typical profile

0 to 4 inches—dark brown very gravelly sandy loam
4 to 17 inches—dark brown very gravelly sandy loam
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 1 inch

Rock Outcrop

Description: Areas of exposed bedrock

Contrasting Inclusions

- Bohannon soils
- Preacher soils in concave, less sloping positions
- Soils that are similar to the Digger soil but have bedrock at a depth of more than 40 inches
- Soils that have an extremely gravelly or extremely cobbly surface layer and are below areas of Rock outcrop
- Digger and Umpcoos soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Map unit

- Areas of Rock outcrop

Digger and Umpcoos

- Steepness of slope
- Hazard of erosion
- Hazard of slope failure
- High amount of rock fragments on the surface and in the soil
- Plant competition
- Seedling mortality
- Depth to rock

Umpcoos

- Hazard of windthrow

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soils are dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- Avoiding areas with a high amount of Rock outcrop will minimize breakage of timber and increase the efficiency of yarding operations.

• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Headwall areas should be avoided when constructing roads.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees on the Umpcoos soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

61C—Dixonville silty clay loam, 3 to 12 percent slopes

Composition

Dixonville soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Ridges and toeslopes
Parent material: Residuum and colluvium derived from basalt
Elevation: 400 to 2,000 feet
Native plants: Douglas fir and bigleaf maple with an understory of creambush oceanspray, western hazel, common snowberry, and mountain brome
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 8 inches—dark brown silty clay loam
8 to 31 inches—dark brown silty clay and clay
31 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 5 inches
Shrink-swell potential: High

Contrasting Inclusions

• Darby and Climax soils in concave positions
• Edenbower and Philomath soils in convex, more steeply sloping positions
• Curtin and Yoncalla soils in concave positions
• Bashaw soils in concave positions and near drainageways
• Dixonville soils that have slopes of more than 12 percent

Major Uses

Cropland, pasture, woodland, and homesite development

Major Management Limitations

• Hazards of compaction and erosion
• Plant competition
• Slow permeability
• High shrink-swell potential
• Hazard of windthrow
• Depth to rock
• Low soil strength

Use and Management

Cropland

• Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

• Use conventional equipment in harvesting, but limit its use when the soil is wet.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.

• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock. Onsite investigation is needed to locate these areas.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
• Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
• Seed cuts and fills to permanent vegetation.

61E—Dixonville silty clay loam, 12 to 30 percent slopes

Composition

Dixonville soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Footslopes and ridges
Parent material: Residuum and colluvium derived from basalt
Elevation: 400 to 2,000 feet
Native plants: Douglas fir and bigleaf maple with an understory of creambush oceanspray, western hazel, common snowberry, and mountain brome
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 8 inches—dark brown silty clay loam
8 to 31 inches—dark brown silty clay and clay
31 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 5 inches
Shrink-swell potential: High

Contrasting Inclusions

• Darby and Climax soils in concave positions
• Edenbower and Philomath soils in convex, more steeply sloping positions
• Curtin and Yoncalla soils in concave, less sloping positions
• Dixonville soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Cropland, pasture, woodland, and homesite development

Major Management Limitations

• Hazards of erosion and compaction
• Steepness of slope
• Plant competition
• Slow permeability
• High shrink-swell potential
• Hazard of windthrow
• Depth to rock
• Low soil strength

Use and Management

Cropland

• Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock. Onsite investigation is needed to locate these areas.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
- Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

62F—Dixonville silty clay loam, 30 to 60 percent north slopes

Composition

Dixonville soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from basalt
Elevation: 400 to 2,000 feet
Native plants: Douglas fir and bigleaf maple with an understory of creambush oceanspray, western hazel, common snowberry, and mountain brome
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 8 inches—dark brown silty clay loam
8 to 31 inches—dark brown silty clay and clay
31 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Darby and Climax soils in concave positions
- Edenbower, Philomath, and Ritner soils in convex, more steeply sloping positions
- Yoncalla soils in concave, less sloping positions
- Dixonville soils that have slopes of less than 30 percent or more than 60 percent

Major Uses

Woodland and pasture

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Slow permeability
- High shrink-swell potential
- Hazard of windthrow
- Depth to rock
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.
- Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

63F—Dixonville silty clay loam, 30 to 60 percent south slopes

Composition

Dixonville soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from basalt
Elevation: 400 to 2,000 feet
Native plants: Douglas fir and California black oak with an understory of hairy honeysuckle, tall Oregongrape, mountain sweetroot, and mountain brome
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 8 inches—dark brown silty clay loam
8 to 31 inches—dark brown silty clay and clay
31 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Darby and Climax soils in concave positions
- Rock outcrop and Edenbower, Philomath, and Ritner soils in convex, more steeply sloping positions
- Yoncalla soils in concave, less sloping positions
- Dixonville soils that have slopes of less than 30 percent or more than 60 percent

Major Uses

Woodland and pasture

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Seedling mortality
- Plant competition
- Slow permeability
- High shrink-swell potential
- Hazard of windthrow
- Depth to rock
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and

harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.
• Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

64F—Dompier-Zing-Beal complex, 30 to 60 percent slopes

Composition

Dompier soil and similar inclusions—35 percent
Zing soil and similar inclusions—20 percent
Beal soil and similar inclusions—20 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Dompier—convex side slopes; Zing—concave side slopes of less than 45 percent; Beal—concave side slopes
Parent material: Residuum and colluvium derived from mica schist
Elevation: 1,100 to 2,800 feet
Native plants: Douglas fir and incense cedar with an understory of salal, cascade Oregongrape, common snowberry, and Pacific poison oak
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Dompier Soil

Typical profile

0 to 16 inches—dark brown silt loam
16 to 24 inches—dark brown silt loam
24 to 32 inches—gray silty clay loam
32 to 60 inches—dark yellowish brown silt loam

Properties and qualities

Depth to restrictive layers: 20 to 40 inches to a fragipan and 60 inches or more to bedrock
Drainage class: Somewhat poorly drained
Depth to water table: 18 to 36 inches in November through May
Permeability: Moderate above the fragipan and very slow through it
Available water capacity: About 7.5 inches

Zing Soil

Typical profile

0 to 7 inches—dark brown loam
7 to 10 inches—dark brown clay loam
10 to 17 inches—dark yellowish brown clay
17 to 45 inches—gray clay
45 to 62 inches—light olive gray clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 24 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Beal Soil

Typical profile

0 to 10 inches—very dark grayish brown and dark brown loam
10 to 18 inches—dark yellowish brown loam
18 to 39 inches—dark yellowish brown clay loam
39 to 60 inches—olive clay loam and clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 24 to 36 inches in November through May
Permeability: Moderately slow
Available water capacity: About 10 inches

Contrasting Inclusions

• Dumont and Sharpshooter soils

• Soils that are similar to the Dompier soils but have a hardpan at a depth of less than 20 inches
• Dompier, Zing, and Beal soils that have slopes of less than 30 percent

Major Use

Woodland

Major Management Limitations

Dompier, Zing, and Beal

• Hazards of erosion and compaction
• Steepness of slope
• Hazard of slope failure
• Hazard of windthrow
• Wetness
• Plant competition

Dompier

• Depth to the fragipan

Zing

• High shrink-swell potential
• Slow permeability
• Low soil strength

Beal

• Moderately slow permeability

Use and Management

Woodland

• Because the soils are unsuited to traffic when wet, use equipment only during dry periods.
• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Slumping can be minimized by locating roads in the less sloping areas or in areas of more well drained soils and by using properly designed road drainage systems.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Avoiding very wet areas, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

65F—Dubakella very stony clay loam, 30 to 60 percent north slopes

Composition

Dubakella soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from serpentinite and peridotite
Elevation: 1,700 to 2,600 feet
Native plants: Douglas fir and incense cedar with an understory of western swordfern
Climatic factors:
Mean annual precipitation—40 to 45 inches
Mean annual air temperature—49 to 52 degrees F
Frost-free period—140 to 180 days

Typical Profile

0 to 3 inches—dark reddish brown very stony clay loam
3 to 33 inches—dark reddish brown very cobbly clay
33 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 2.5 inches

Contrasting Inclusions

• Pearsoll soils and Rock outcrop in convex, more steeply sloping positions
• Peel and Eightlar soils in concave, less sloping positions

• Soils that are similar to this Dubakella soil but are less affected by the nutrient imbalance of the parent material
• Dubakella soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

• Low fertility
• Steepness of slope
• Hazards of erosion and compaction
• High amount of rock fragments on the surface and in the soil
• Seedling mortality
• Plant competition
• Slow permeability
• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Avoiding areas with a high amount of Rock outcrop and stones will minimize breakage of timber and increase the efficiency of yarding operations.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

66F—Dubakella very stony clay loam, 30 to 60 percent south slopes

Composition

Dubakella soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from serpentinite and peridotite
Elevation: 1,700 to 2,600 feet
Native plants: Douglas fir, Jeffrey pine, and incense cedar with an understory of western swordfern
Climatic factors:
Mean annual precipitation—40 to 45 inches
Mean annual air temperature—49 to 52 degrees F
Frost-free period—140 to 180 days

Typical Profile

0 to 3 inches—dark reddish brown very stony clay loam
3 to 33 inches—dark reddish brown very cobbly clay
33 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 2.5 inches

Contrasting Inclusions

• Pearsoll soils and Rock outcrop in convex, more steeply sloping positions
• Peel and Eightlar soils in concave, less sloping positions
• Soils that are similar to this Dubakella soil but are less affected by the nutrient imbalance of the parent material
• Dubakella soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

• Low fertility
• Steepness of slope

- Hazards of erosion and compaction
- High amount of rock fragments on the surface and in the soil
- Seedling mortality
- Plant competition
- Slow permeability
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Avoiding areas with a high amount of Rock outcrop and stones will minimize breakage of timber and increase the efficiency of yarding operations.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

67E—Dubakella-Pearsoll complex, 5 to 30 percent slopes

Composition

Dubakella soil and similar inclusions—40 percent
Pearsoll soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Ridges
Parent material: Colluvium and residuum derived from serpentinite and peridotite
Elevation: 700 to 3,800 feet
Native plants: Dubakella—Jeffrey pine, incense cedar, and scattered Douglas fir with an understory of canyon live oak, California fescue, and pine bluegrass; Pearsoll—Jeffrey pine with an understory of wedgeleaf ceanothus, sheep fescue, pine bluegrass, iris, and western buttercup
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—47 to 53 degrees F
Frost-free period—120 to 200 days

Dubakella Soil

Typical profile

0 to 3 inches—dark reddish brown very stony clay loam
3 to 33 inches—dark reddish brown very cobbly clay
33 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 2.5 inches

Pearsoll Soil

Typical profile

0 to 6 inches—dark reddish brown extremely stony clay loam
6 to 14 inches—dark reddish brown extremely cobbly clay
14 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 1.5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Acker, Atring, Beekman, Gravecreek, Josephine, Norling, and Speaker soils
- Peel and Eightlar soils in concave, less sloping positions and on footslopes

• Rock outcrop in convex, more steeply sloping positions
• Soils that are similar to the Dubakella and Pearsoll soils but have less than 35 percent rock fragments
• Soils that are similar to the Dubakella and Pearsoll soils but are less affected by the nutrient imbalance of the parent material
• Dubakella and Pearsoll soils that have slopes of more than 30 percent

Major Uses

Woodland and livestock grazing

Major Management Limitations

Dubakella and Pearsoll

• Low fertility
• Hazards of compaction and erosion
• High amount of rock fragments on the surface and in the soil
• Steepness of slope
• Seedling mortality
• Plant competition
• Slow permeability
• Hazard of windthrow
• Depth to rock

Pearsoll

• High shrink-swell potential
• Low soil strength
• Droughtiness

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Avoiding areas with a high amount of Rock outcrop and stones will minimize breakage of timber and increase the efficiency of yarding operations.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

Livestock grazing

• Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
• Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
• Brush management and seeding reduce competition from woody plants and improve degraded areas.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

68F—Dubakella-Pearsoll complex, 30 to 70 percent north slopes

Composition

Dubakella soil and similar inclusions—40 percent
Pearsoll soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from serpentinite and peridotite
Elevation: 700 to 3,800 feet
Native plants: Dubakella—Jeffrey pine, incense cedar, and scattered Douglas fir with an understory of canyon live oak, California fescue, and pine bluegrass; Pearsoll—Jeffrey pine with an understory of wedgeleaf ceanothus, sheep fescue, pine bluegrass, iris, and western buttercup
Climatic factors:
Mean annual precipitation—35 to 55 inches

Mean annual air temperature—47 to 53 degrees F
Frost-free period—120 to 200 days

Dubakella Soil

Typical profile

0 to 3 inches—dark reddish brown very stony clay loam
3 to 33 inches—dark reddish brown very cobbly clay
33 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 2.5 inches

Pearsoll Soil

Typical profile

0 to 6 inches—dark reddish brown extremely stony clay loam
6 to 14 inches—dark reddish brown extremely cobbly clay
14 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 1.5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Acker, Atring, Beekman, Gravecreek, Josephine, Norling, and Speaker soils
- Peel and Eightlar soils in concave, less sloping positions
- Rock outcrop in convex, more steeply sloping positions
- Soils that are similar to the Dubakella and Pearsoll soils but have less than 35 percent rock fragments
- Soils that are similar to the Dubakella and Pearsoll soils but are less affected by the nutrient imbalance of the parent material
- Dubakella and Pearsoll soils that have slopes of less than 30 percent or more than 70 percent

Major Uses

Woodland and livestock grazing

Major Management Limitations

Dubakella and Pearsoll

- Low fertility
- Steepness of slope
- Hazards of erosion and compaction
- High amount of rock fragments on the surface and in the soil
- Seedling mortality
- Plant competition
- Slow permeability
- Hazard of windthrow
- Depth to rock

Pearsoll

- High shrink-swell potential
- Low soil strength
- Droughtiness

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Avoiding areas with a high amount of Rock outcrop and stones will minimize breakage of timber and increase the efficiency of yarding operations.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

Livestock grazing

- Using a grazing system that controls the timing and

duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
• Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soils and plant roots.
• Brush management and seeding reduce competition from woody plants and improve degraded areas.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.
• Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

69C—Dumont gravelly loam, 2 to 12 percent slopes

Composition

Dumont soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Toeslopes
Parent material: Residuum and colluvium derived from metamorphic rock
Elevation: 1,000 to 4,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, cascade Oregongrape, and western swordfern
Climatic factors:
Mean annual precipitation—40 to 60 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Typical Profile

0 to 8 inches—dark brown gravelly loam
8 to 16 inches—yellowish red clay loam
16 to 40 inches—red clay
40 to 70 inches—red clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Contrasting Inclusions

• Acker, McGinnis, Norling, and Tishar soils in convex, more steeply sloping positions
• Zing soils in concave positions and near drainageways
• Abegg soils on alluvial fans
• Dumont soils that have slopes of more than 12 percent

Major Uses

Woodland, hay and pasture, and homesite development

Major Management Limitations

• Hazards of compaction and erosion
• Plant competition
• Moderately slow permeability

Use and Management

Woodland

• Use conventional equipment in harvesting, but limit its use when the soil is wet.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Hay and pasture

• Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to control runoff and erosion.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Seed cuts and fills to permanent vegetation.

69E—Dumont gravelly loam, 12 to 30 percent slopes

Composition

Dumont soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes and ridges
Parent material: Residuum and colluvium derived from metamorphic rock
Elevation: 1,000 to 4,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, cascade Oregongrape, and western swordfern
Climatic factors:
Mean annual precipitation—40 to 60 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Typical Profile

0 to 8 inches—dark brown gravelly loam
8 to 16 inches—yellowish red clay loam
16 to 40 inches—red clay
40 to 70 inches—red clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Contrasting Inclusions

• Acker, McGinnis, Norling, and Tishar soils in convex, more steeply sloping positions
• Zing soils in concave positions and near drainageways
• Abegg soils on alluvial fans
• Dumont soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Woodland, and hay and pasture

Major Management Limitations

• Hazards of erosion and compaction
• Steepness of slope
• Plant competition
• Moderately slow permeability

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Hay and pasture

• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Tillage and seeding should be done on the contour or across the slope where practical.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

70F—Dumont gravelly loam, 30 to 60 percent north slopes

Composition

Dumont soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from metamorphic rock
Elevation: 1,000 to 4,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, cascade Oregongrape, and western swordfern
Climatic factors:
Mean annual precipitation—40 to 60 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Typical Profile

0 to 8 inches—dark brown gravelly loam
8 to 16 inches—yellowish red clay loam
16 to 40 inches—red clay
40 to 70 inches—red clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Contrasting Inclusions

- Acker soils
- McGinnis, Norling, and Tishar soils in convex, more steeply sloping positions
- Atring and Kanid soils in convex, more steeply sloping positions
- Zing soils in concave, less sloping positions
- Dumont soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

71F—Dumont gravelly loam, 30 to 60 percent south slopes

Composition

Dumont soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from metamorphic rock
Elevation: 1,000 to 4,000 feet
Native plants: Douglas fir and Pacific madrone with an understory of creambush oceanspray, cascade Oregongrape, whipplevine, and mountain brome
Climatic factors:
Mean annual precipitation—40 to 60 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Typical Profile

0 to 8 inches—dark brown gravelly loam
8 to 16 inches—yellowish red clay loam
16 to 40 inches—red clay
40 to 70 inches—red clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Contrasting Inclusions

- Acker soils

• McGinnis, Norling, Tishar, Atring, and Kanid soils in convex, more steeply sloping positions
• Zing soils in concave, less sloping positions
• Dumont soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

• Steepness of slope
• Hazards of erosion and compaction
• Seedling mortality
• Plant competition
• Moderately slow permeability

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars and culverts.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

72E—Dumont gravelly loam, granitic substratum, 3 to 30 percent slopes

Composition

Dumont soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Ridges and footslopes
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 1,400 to 3,000 feet
Native plants: Douglas fir with an understory of salal, golden chinkapin, cascade Oregongrape, and deerfoot vanillaleaf
Climatic factors:
Mean annual precipitation—40 to 50 inches
Mean annual air temperature—48 to 52 degrees F
Frost-free period—120 to 180 days

Typical Profile

0 to 4 inches—dark brown gravelly loam
4 to 10 inches—dark reddish brown clay loam
10 to 50 inches—dark red clay
50 to 60 inches—dark reddish brown clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Contrasting Inclusions

• Zing soils in concave positions and near drainageways
• Soils that are similar to this Dumont soil but are less than 40 inches deep to bedrock and are in convex positions
• Lettia soils in convex positions and on more steeply sloping side slopes
• Dumont soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

• Hazards of erosion and compaction
• Plant competition
• Seedling mortality
• Steepness of slope
• Moderately slow permeability
• Low soil strength
• Hazard of fire damage

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but

cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.

73E—Dumont-Zing complex, 2 to 30 percent slopes

Composition

Dumont soil and similar inclusions—50 percent
Zing soil and similar inclusions—30 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Dumont—convex toeslopes and footslopes; Zing—swales
Parent material: Residuum and colluvium derived from metamorphic rock
Elevation: 1,000 to 4,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, cascade Oregongrape, and western swordfern
Climatic factors:
Mean annual precipitation—40 to 60 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Dumont Soil

Typical profile

0 to 8 inches—dark brown gravelly loam
8 to 16 inches—yellowish red clay loam
16 to 40 inches—red clay
40 to 70 inches—red clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Zing Soil

Typical profile

0 to 7 inches—dark brown loam
7 to 10 inches—dark brown clay loam
10 to 17 inches—dark yellowish brown clay
17 to 45 inches—gray clay
45 to 62 inches—light olive gray clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 24 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

• Soils that are similar to the Zing soil but are poorly drained and are in concave positions and near drainageways
• Acker, McGinnis, Norling, and Tishar soils in convex, more steeply sloping positions
• Abegg soils on alluvial fans
• Dumont and Zing soils that have slopes of more than 30 percent

Major Uses

Woodland, and hay and pasture

Major Management Limitations

Dumont and Zing

• Hazards of compaction and erosion
• Hazard of slope failure
• Plant competition
• Steepness of slope

Dumont

• Moderately slow permeability

Zing

- Wetness
- High shrink-swell potential
- Slow permeability
- Low soil strength
- Hazard of windthrow

Use and Management

Woodland

- Because the Zing soil is unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees on the Zing soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Hay and pasture

- Sprinkler and trickle irrigation systems are suited to the less sloping areas of this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- In areas of the Zing soil, select plants that can tolerate wetness.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

74—Duneland

Composition

Duneland—90 percent
Contrasting inclusions—10 percent

Setting

Landform: Dunes
Slope: 3 to 30 percent
Parent material: Eolian sand
Elevation: 10 to 150 feet
Vegetation: Barren except for scattered clumps of European beachgrass
Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—51 to 53 degrees F
Frost-free period—180 to 240 days

Typical Profile

0 to 60 inches—light gray fine and medium sand

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: About 2.5 inches
Hazard of wind erosion: High

Contrasting Inclusions

- Waldport soils
- Heceta soils in concave positions

Major Uses

Recreation and wildlife habitat

Major Management Limitations

- Hazard of wind erosion
- Instability of the sand

75C—Dupee silty clay loam, 3 to 12 percent slopes

Composition

Dupee soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Toeslopes and swales
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 400 to 2,000 feet
Native plants: Oregon white oak and Oregon ash with an understory of Pacific poison oak, common snowberry, rose, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 9 inches—dark brown silty clay loam
9 to 30 inches—dark brown silty clay
30 to 63 inches—mottled, dark brown and yellowish brown clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 18 to 36 inches in December through April
Permeability: Moderately slow
Available water capacity: About 11 inches

Contrasting Inclusions

- Pengra and Sutherlin soils
- Bateman, Oakland, Rosehaven, and Windygap silt loam in convex positions
- Panther soils near drainageways
- Dupee soils that have slopes of more than 12 percent

Major Uses

Hay and pasture, and homesite development

Major Management Limitations

- Wetness
- Hazards of compaction and erosion
- Moderately slow permeability
- Low soil strength

Use and Management

Hay and pasture

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate wetness.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
- If a suitable outlet is available, tile drains can be used to divert subsurface water away from the absorption field.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
- Roads should be designed to offset the limited ability of the soil to support a load.
- Seed cuts and fills to permanent vegetation.

75E—Dupee silty clay loam, 12 to 30 percent slopes

Composition

Dupee soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Footslopes and concave side slopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 400 to 2,000 feet
Native plants: Oregon white oak and Oregon ash with an understory of Pacific poison oak, common snowberry, rose, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 9 inches—dark brown silty clay loam
9 to 30 inches—dark brown silty clay
30 to 63 inches—mottled, dark brown and yellowish brown clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 18 to 36 inches in December through April
Permeability: Moderately slow
Available water capacity: About 11 inches

Contrasting Inclusions

- Pengra and Sutherlin soils
- Bateman, Oakland, Rosehaven, and Windygap silt loam in convex positions
- Panther soils near drainageways
- Dupee soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Hay and pasture, and homesite development

Major Management Limitations

- Steepness of slope
- Wetness
- Hazards of erosion and compaction
- Moderately slow permeability
- Hazard of slope failure
- Low soil strength

Use and Management

Hay and pasture

- Sprinkler and trickle irrigation systems are suited to the less sloping areas of this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate wetness.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
- Interceptor ditches can be used to divert subsurface water away from the absorption field.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
- Roads should be designed to offset the limited ability of the soil to support a load.
- Slumping can be minimized by restricting the construction of roads and other activities that disturb

the soil to the less sloping areas and by using properly designed road drainage systems.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

76E—Edenbower clay, 3 to 30 percent slopes

Composition

Edenbower soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Ridges and convex side slopes
Parent material: Colluvium and residuum derived from basalt
Elevation: 400 to 2,000 feet
Native plants: Pine bluegrass, blue wildrye, western buttercup, and western yarrow
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 8 inches—very dark brown clay
8 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 4 to 10 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 1 inch
Shrink-swell potential: High

Contrasting Inclusions

• Climax, Dixonville, and Philomath soils
• Darby soils in concave positions
• Curtin and Yoncalla soils in concave, less sloping positions
• Edenbower soils that have slopes of more than 30 percent

Major Uses

Livestock grazing and homesite development

Major Management Limitations

• Depth to rock
• Hazards of compaction and erosion
• Steepness of slope
• High shrink-swell potential
• Slow permeability
• Low soil strength

Use and Management

Livestock grazing

• Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
• Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
• Brush management and seeding reduce competition from woody plants and improve degraded areas.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• In many areas, it may be necessary to haul in topsoil for lawns and gardens.
• This soil generally is not suitable for septic tank absorption fields; however, areas of suitable included soils may be in the unit. Onsite investigation is needed to locate these areas.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
• Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Ripping and blasting are needed for road construction in some areas of this unit.

77D—Eightlar very gravelly silty clay loam, 5 to 20 percent slopes

Composition

Eightlar soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills
Landscape position: Alluvial fans
Parent material: Alluvium derived from serpentinitic rock
Elevation: 700 to 1,800 feet
Native plants: Wedgeleaf ceanothus, California fescue, and blue wildrye with scattered ponderosa pine and incense cedar
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—52 to 54 degrees F
Frost-free period—160 to 200 days

Typical Profile

0 to 3 inches—very dark brown very gravelly silty clay loam
3 to 35 inches—very dark brown very gravelly clay
35 to 60 inches—dark yellowish brown very cobbly sandy clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Very slow
Available water capacity: About 6 inches
Shrink-swell potential: High

Contrasting Inclusions

- Abegg soils
- Dubakella soils in convex, more steeply sloping positions
- Eightlar soils that have a stony surface layer
- Eightlar soils that have slopes of more than 20 percent

Major Uses

Hay and pasture, and homesite development

Major Management Limitations

- Low fertility
- Hazards of compaction and erosion
- High amount of rock fragments on the surface and in the soil
- High shrink-swell potential
- Very slow permeability
- Low soil strength

Use and Management

Hay and pasture

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that are tolerant of low soil fertility.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Remove gravel, cobbles, and stones in disturbed areas for best results when landscaping.
- In many areas, it may be necessary to haul in topsoil for lawns and gardens.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
- Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

78A—Evans loam, 0 to 3 percent slopes

Composition

Evans soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Flood plains

Landscape position: Low flood plains
Parent material: Mixed alluvium
Elevation: 100 to 1,600 feet
Native plants: Bigleaf maple and Oregon ash with an understory of common snowberry, mockorange, western hazel, and Kentucky bluegrass
Climatic factors:
Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 27 inches—very dark grayish brown loam
27 to 43 inches—very dark grayish brown very fine sandy loam
43 to 63 inches—dark brown very fine sandy loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 11 inches
Frequency of flooding: Occasional in December through March

Contrasting Inclusions

- Camas and Newberg soils on lower flood plains
- Chapman and Chehalis soils on higher flood plains
- Sibold soils in concave positions

Major Uses

Cropland and pasture

Major Management Limitations

- Hazard of flooding
- Hazard of compaction

Use and Management

Cropland

- Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Leveling is needed in sloping areas.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Reduce the risk of erosion by providing structures along streambanks to control the flow of water and by planting cover crops.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

79E—Fernhaven gravelly loam, 3 to 30 percent slopes

Composition

Fernhaven soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Broad ridges and side slopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 90 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Typical Profile

0 to 12 inches—dark brown and dark yellowish brown gravelly loam
12 to 31 inches—dark brown loam
31 to 63 inches—strong brown and dark yellowish brown clay loam
63 to 72 inches—dark yellowish brown loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 11.5 inches

Contrasting Inclusions

- Honeygrove, Orford, and Xanadu soils
- Bohannon and Digger soils in convex, more steeply sloping positions
- Soils that are similar to this Fernhaven soil but have more than 35 percent rock fragments

• Soils that are similar to this Fernhaven soil but are poorly drained and are in concave positions and near drainageways
• Fernhaven soils that have a very gravelly surface layer
• Fernhaven soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

• Hazards of compaction and erosion
• Plant competition
• Steepness of slope

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

79F—Fernhaven gravelly loam, 30 to 50 percent slopes

Composition

Fernhaven soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes and ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 90 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Typical Profile

0 to 12 inches—dark brown and dark yellowish brown gravelly loam
12 to 31 inches—dark brown loam
31 to 63 inches—strong brown and dark yellowish brown clay loam
63 to 72 inches—dark yellowish brown loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 11.5 inches

Contrasting Inclusions

• Bohannon and Digger soils in convex, more steeply sloping positions
• Honeygrove, Orford, and Xanadu soils in concave, less sloping positions
• Soils that are similar to this Fernhaven soil but have more than 35 percent rock fragments
• Fernhaven soils that have a very gravelly surface layer
• Fernhaven soils that have slopes of less than 30 percent or more than 50 percent

Major Use

Woodland

Major Management Limitations

• Steepness of slope
• Hazards of erosion and compaction
• Plant competition

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.

• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

79G—Fernhaven gravelly loam, 50 to 75 percent slopes

Composition

Fernhaven soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from sandstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 90 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Typical Profile

0 to 12 inches—dark brown and dark yellowish brown gravelly loam
12 to 31 inches—dark brown loam
31 to 63 inches—strong brown and dark yellowish brown clay loam
63 to 72 inches—dark yellowish brown loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 11.5 inches

Contrasting Inclusions

• Bohannon and Digger soils in convex positions
• Umpcoos soils in convex, more steeply sloping positions
• Soils that are similar to this Fernhaven soil but have more than 35 percent rock fragments
• Fernhaven soils that have a very gravelly surface layer
• Fernhaven soils that have slopes of less than 50 percent or more than 75 percent

Major Use

Woodland

Major Management Limitations

• Steepness of slope
• Hazards of erosion and compaction
• Hazard of slope failure
• Plant competition

Use and Management

Woodland

• Highlead or other cable logging systems are best suited to this unit.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
• To reduce the risk of compaction, use suitable logging systems and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
• Headwall areas should be avoided when constructing roads.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

80E—Fernhaven-Digger complex, 3 to 30 percent slopes

Composition

Fernhaven soil and similar inclusions—45 percent
Digger soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Fernhaven—ridges and concave side slopes; Digger—ridges and convex side slopes

Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 90 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Fernhaven Soil

Typical profile

0 to 12 inches—dark brown and dark yellowish brown gravelly loam
12 to 31 inches—dark brown loam
31 to 63 inches—strong brown and dark yellowish brown clay loam
63 to 72 inches—dark yellowish brown loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 11.5 inches

Digger Soil

Typical profile

0 to 6 inches—very dark grayish brown very gravelly loam
6 to 19 inches—dark brown very gravelly loam
19 to 28 inches—dark brown very gravelly loam
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Contrasting Inclusions

- Honeygrove, Orford, and Xanadu soils
- Bohannon soils in convex, more steeply sloping positions
- Soils that are similar to the Fernhaven and Digger soils but are poorly drained and are in concave positions and near drainageways
- Soils that are similar to the Digger soil but have bedrock at a depth of more than 40 inches
- Fernhaven soils that have a very gravelly surface layer
- Fernhaven and Digger soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Fernhaven and Digger

- Hazards of compaction and erosion
- Plant competition
- Steepness of slope

Digger

- High amount of rock fragments on the surface and in the soil
- Seedling mortality
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Digger soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Digger soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

80F—Fernhaven-Digger complex, 30 to 60 percent slopes

Composition

Fernhaven soil and similar inclusions—45 percent
Digger soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Fernhaven—concave side slopes; Digger—convex side slopes and ridges
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 90 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Fernhaven Soil

Typical profile

0 to 12 inches—dark brown and dark yellowish brown gravelly loam
12 to 31 inches—dark brown loam
31 to 63 inches—strong brown and dark yellowish brown clay loam
63 to 72 inches—dark yellowish brown loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 11.5 inches

Digger Soil

Typical profile

0 to 6 inches—very dark grayish brown very gravelly loam
6 to 19 inches—dark brown very gravelly loam
19 to 28 inches—dark brown very gravelly loam
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Contrasting Inclusions

• Bohannon soils in convex, more steeply sloping positions
• Honeygrove, Orford, and Xanadu soils in concave, less sloping positions
• Soils that are similar to the Digger soil but have bedrock at a depth of more than 40 inches
• Fernhaven soils that have a very gravelly surface layer
• Fernhaven and Digger soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Fernhaven and Digger

• Steepness of slope
• Hazards of erosion
• Plant competition

Fernhaven

• Hazard of compaction

Digger

• High amount of rock fragments on the surface and in the soil
• Seedling mortality
• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on the Digger soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.

• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees on the Digger soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

81A—Foehlin gravelly loam, 0 to 3 percent slopes

Composition

Foehlin soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Terraces
Landscape position: Low terraces
Parent material: Mixed alluvium
Elevation: 500 to 1,600 feet
Native plants: Douglas fir and Pacific madrone with an understory of common snowberry, Pacific poison oak, creambush oceanspray, and mountain brome
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 5 inches—very dark grayish brown gravelly loam
5 to 12 inches—dark brown gravelly loam
12 to 60 inches—dark yellowish brown gravelly clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Contrasting Inclusions

• Malabon and Medford soils on terraces
• Banning soils in concave positions
• Packard soils in convex positions
• Malabon and Roseburg soils on flood plains

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

• Hazard of compaction
• Moderately slow permeability

Use and Management

Cropland

• Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Leveling is needed in sloping areas.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.

81C—Foehlin gravelly loam, 3 to 12 percent slopes

Composition

Foehlin soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Alluvial fans
Parent material: Mixed alluvium
Elevation: 500 to 1,600 feet
Native plants: Douglas fir and Pacific madrone with an

understory of common snowberry, Pacific poison oak, creambush oceanspray, and mountain brome
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 5 inches—very dark grayish brown gravelly loam
5 to 12 inches—dark brown gravelly loam
12 to 60 inches—dark yellowish brown gravelly clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Contrasting Inclusions

- Abegg, Banning, and Medford soils
- Foehlin soils that have slopes of more than 12 percent

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

- Hazards of compaction and erosion
- Moderately slow permeability

Use and Management

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Seed cuts and fills to permanent vegetation.

82C—Fordice very cobbly loam, 0 to 12 percent slopes

Composition

Fordice soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Terraces
Landscape position: High terraces
Parent material: Mixed alluvium
Elevation: 500 to 1,400 feet
Native plants: Douglas fir and Pacific madrone with an understory of rose, Pacific poison oak, common snowberry, and mountain brome
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 13 inches—dark brown very cobbly loam
13 to 19 inches—dark brown extremely cobbly loam
19 to 35 inches—dark brown extremely gravelly clay loam
35 to 63 inches—dark brown extremely cobbly clay loam and extremely cobbly loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5 inches

Contrasting Inclusions

- Pollard and Josephine soils
- Soils that are similar to this Fordice soil but have a clay subsoil
- Fordice soils that have slopes of more than 12 percent

Major Uses

Hay and pasture, and homesite development

Major Management Limitations

- High amount of rock fragments on the surface and in the soil
- Hazard of erosion
- Droughtiness

Use and Management

Hay and pasture

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Applications of irrigation water should be light and frequent.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- For best results in landscaping, remove gravel and cobbles in disturbed areas.
- In many areas, it may be necessary to haul in topsoil for lawns and gardens.
- Seed cuts and fills to permanent vegetation.

83A—Glide fine sandy loam, 0 to 3 percent slopes

Composition

Glide soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Flood plains
Landscape position: High flood plains
Parent material: Ashy alluvium
Elevation: 400 to 800 feet
Native plants: None; all areas are cultivated
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 5 inches—black fine sandy loam
5 to 12 inches—black gravelly sandy loam
12 to 36 inches—black and very dark brown gravelly loamy sand
36 to 63 inches—dark brown gravelly sand and gravelly loamy sand

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 13 inches
Frequency of flooding: Rare

Contrasting Inclusions

- Roseburg and Sibold soils
- Coburg soils on flood plains
- Packard soils on flood plains
- Glide soils that are not flooded

Major Uses

Cropland and pasture

Major Management Limitations

- Hazard of compaction
- Hazard of flooding
- Coarse texture

Use and Management

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risk of compaction of the surface layer

by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

84E—Gravecreek gravelly loam, 12 to 30 percent slopes

Composition

Gravecreek soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Ridges and side slopes
Parent material: Colluvium derived from serpentinitic rock
Elevation: 3,000 to 5,000 feet
Native plants: Douglas fir and Pacific madrone with an understory of cascade Oregongrape, common beargrass, and western swordfern
Climatic factors:
Mean annual precipitation—45 to 55 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Typical Profile

0 to 7 inches—dark brown gravelly loam
7 to 15 inches—yellowish brown gravelly loam
15 to 30 inches—yellowish brown very gravelly clay loam
30 to 37 inches—yellowish brown very gravelly clay loam
37 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4 inches

Contrasting Inclusions

• Dubakella and Norling soils
• Rock outcrop and Pearsoll soils in convex positions
• Acker and Dumont soils in concave positions
• Soils that are similar to this Gravecreek soil but have bedrock at a depth of more than 40 inches and are in concave positions
• Soils that are similar to this Gravecreek soil but are cold
• Gravecreek soils that have slopes of less than 12 percent or more than 30 percent

Major Use

Woodland

Major Management Limitations

• Low fertility
• Hazards of erosion and compaction
• High amount of rock fragments in the soil
• Steepness of slope
• Seedling mortality
• Plant competition
• Moderately slow permeability
• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

85F—Gravecreek gravelly loam, 30 to 60 percent north slopes

Composition

Gravecreek soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from serpentinitic rock
Elevation: 3,000 to 5,000 feet
Native plants: Douglas fir and Pacific madrone with an understory of cascade Oregongrape, common beargrass, and western swordfern
Climatic factors:
Mean annual precipitation—45 to 55 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Typical Profile

0 to 7 inches—dark brown gravelly loam
7 to 15 inches—yellowish brown gravelly loam
15 to 30 inches—yellowish brown very gravelly clay loam
30 to 37 inches—yellowish brown very gravelly clay loam
37 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4 inches

Contrasting Inclusions

- Dubakella and Norling soils
- Rock outcrop and Pearsoll soils in convex positions
- Acker and Dumont soils in concave, less sloping positions
- Soils that are similar to this Gravecreek soil but have bedrock at a depth of more than 40 inches and are in concave, less sloping positions
- Soils that are similar to this Gravecreek soil but are cold
- Gravecreek soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Low fertility
- Steepness of slope
- Hazards of erosion and compaction
- High amount of rock fragments in the soil
- Seedling mortality
- Plant competition
- Moderately slow permeability
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

85G—Gravecreek gravelly loam, 60 to 80 percent north slopes

Composition

Gravecreek soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains

Landscape position: Side slopes
Parent material: Colluvium derived from serpentinitic rock
Elevation: 3,000 to 5,000 feet
Native plants: Douglas fir and Pacific madrone with an understory of cascade Oregongrape, common beargrass, and western swordfern
Climatic factors:
Mean annual precipitation—45 to 55 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Typical Profile

0 to 7 inches—dark brown gravelly loam
7 to 15 inches—yellowish brown gravelly loam
15 to 30 inches—yellowish brown very gravelly clay loam
30 to 37 inches—yellowish brown very gravelly clay loam
37 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4 inches

Contrasting Inclusions

- Dubakella and Norling soils
- Rock outcrop and Pearsoll soils in convex positions
- Acker soils in concave, less sloping positions
- Soils that are similar to this Gravecreek soil but have bedrock at a depth of more than 40 inches and are in concave, less sloping positions
- Soils that are similar to this Gravecreek soil but are cold
- Gravecreek soils that have slopes of less than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Low fertility
- Hazards of erosion and compaction
- Hazard of slope failure
- High amount of rock fragments in the soil
- Seedling mortality
- Plant competition
- Moderately slow permeability
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

86F—Gravecreek gravelly loam, 30 to 60 percent south slopes

Composition

Gravecreek soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from serpentinitic rock
Elevation: 3,000 to 5,000 feet
Native plants: Douglas fir and Jeffrey pine with an understory of canyon live oak, common

beargrass, creambush oceanspray, and California fescue

Climatic factors:
Mean annual precipitation—45 to 55 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Typical Profile

0 to 7 inches—dark brown gravelly loam
7 to 15 inches—yellowish brown gravelly loam
15 to 30 inches—yellowish brown very gravelly clay loam
30 to 37 inches—yellowish brown very gravelly clay loam
37 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4 inches

Contrasting Inclusions

- Dubakella and Norling soils
- Acker and Dumont soils in concave, less sloping positions
- Rock outcrop and Pearsoll soils in convex positions
- Soils that are similar to this Gravecreek soil but have bedrock at a depth of more than 40 inches and are in concave, less sloping positions
- Gravecreek soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Low fertility
- Steepness of slope
- Hazards of erosion and compaction
- High amount of rock fragments in the soil
- Seedling mortality
- Plant competition
- Moderately slow permeability
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

86G—Gravecreek gravelly loam, 60 to 80 percent south slopes

Composition

Gravecreek soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from serpentinitic rock
Elevation: 3,000 to 5,000 feet
Native plants: Douglas fir and Jeffrey pine with an understory of canyon live oak, common beargrass, creambush oceanspray, and California fescue
Climatic factors:
Mean annual precipitation—45 to 55 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Typical Profile

0 to 7 inches—dark brown gravelly loam

7 to 15 inches—yellowish brown gravelly loam
15 to 30 inches—yellowish brown very gravelly clay loam
30 to 37 inches—yellowish brown very gravelly clay loam
37 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4 inches

Contrasting Inclusions

- Dubakella and Norling soils
- Rock outcrop and Pearsoll soils in convex positions
- Acker soils in concave, less sloping positions
- Soils that are similar to this Gravecreek soil but have bedrock at a depth of more than 40 inches and are in concave, less sloping positions
- Gravecreek soils that have slopes of less than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Low fertility
- Hazards of erosion and compaction
- Hazard of slope failure
- High amount of rock fragments in the soil
- Seedling mortality
- Plant competition
- Moderately slow permeability
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

87E—Greengulch-Cedargrove complex, 3 to 30 percent slopes

Composition

Greengulch soil and similar inclusions—45 percent
Cedargrove soil and similar inclusions—40 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Ridges and footslopes
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 800 to 2,200 feet
Native plants: Douglas fir and ponderosa pine with an understory of creambush oceanspray, tall Oregongrape, hairy honeysuckle, and California fescue
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—49 to 53 degrees F
Frost-free period—150 to 200 days

Greengulch Soil

Typical profile

0 to 3 inches—dark yellowish brown silt loam
3 to 10 inches—dark brown silty clay loam
10 to 30 inches—dark brown and strong brown clay
30 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches
Shrink-swell potential: High

Cedargrove Soil

Typical profile

0 to 14 inches—dark brown silt loam
14 to 30 inches—dark brown silty clay loam
30 to 60 inches—dark brown clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Josephine, Pollard, and Speaker soils derived from metamorphic rock
- Wolfpeak soils in convex positions
- Siskiyou and Tethrick soils in more steeply sloping positions
- Zing soils in concave positions and near drainageways
- Greengulch and Cedargrove soils that have slopes of more than 30 percent

Major Uses

Woodland, hay and pasture, and homesite development

Major Management Limitations

Greengulch and Cedargrove

- Hazards of erosion and compaction
- Plant competition
- Seedling mortality
- Steepness of slope
- Moderately slow permeability
- Low soil strength
- Hazard of fire damage

Greengulch

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees on the Greengulch soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soils and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt encourage livestock to graze in areas where access is limited.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.

• Septic tank absorption fields should be installed in areas that are deeper to bedrock. Onsite investigation is needed to locate these areas.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
• Buildings and roads should be designed to offset the limited ability of the soils to support a load.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

88F—Greengulch-Cedargrove complex, 30 to 60 percent north slopes

Composition

Greengulch soil and similar inclusions—45 percent
Cedargrove soil and similar inclusions—40 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 800 to 2,200 feet
Native plants: Douglas fir and grand fir with an understory of salal, cascade Oregongrape, creambush oceanspray, and whipplevine
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—49 to 53 degrees F
Frost-free period—150 to 200 days

Greengulch Soil

Typical profile

0 to 3 inches—dark yellowish brown silt loam
3 to 10 inches—dark brown silty clay loam
10 to 30 inches—dark brown and strong brown clay
30 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches
Shrink-swell potential: High

Cedargrove Soil

Typical profile

0 to 14 inches—dark brown silt loam
14 to 30 inches—dark brown silty clay loam
30 to 60 inches—dark brown clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

• Josephine, Pollard, and Speaker soils derived from metamorphic rock
• Wolfpeak soils in convex positions
• Siskiyou and Tethrick soils in more steeply sloping positions
• Zing soils in concave, less sloping positions
• Greengulch and Cedargrove soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Greengulch and Cedargrove

• Hazards of erosion and compaction
• Steepness of slope
• Plant competition
• Seedling mortality
• Moderately slow permeability
• Low soil strength
• Hazard of fire damage
• High shrink-swell potential

Greengulch

• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.

• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
• Trees on the Greengulch soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

89F—Greengulch-Cedargrove complex, 30 to 60 percent south slopes

Composition

Greengulch soil and similar inclusions—45 percent
Cedargrove soil and similar inclusions—40 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 800 to 2,200 feet
Native plants: Douglas fir and ponderosa pine with an understory of creambush oceanspray, tall Oregongrape, hairy honeysuckle, and California fescue
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—49 to 53 degrees F
Frost-free period—150 to 200 days

Greengulch Soil

Typical profile

0 to 3 inches—dark yellowish brown silt loam
3 to 10 inches—dark brown silty clay loam
10 to 30 inches—dark brown and strong brown clay
30 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches
Shrink-swell potential: High

Cedargrove Soil

Typical profile

0 to 14 inches—dark brown silt loam
14 to 30 inches—dark brown silty clay loam
30 to 60 inches—dark brown clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

• Josephine, Pollard, and Speaker soils derived from metamorphic rock
• Wolfpeak soils in convex positions
• Siskiyou and Tethrick soils in more steeply sloping positions
• Zing soils in concave, less sloping positions
• Greengulch and Cedargrove soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Greengulch and Cedargrove

• Hazards of erosion and compaction
• Steepness of slope
• Seedling mortality
• Plant competition
• Moderately slow permeability
• Hazard of fire damage
• Low soil strength

Greengulch

• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.

- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees on the Greengulch soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

90E—Gustin-Orford complex, 3 to 30 percent slopes

Composition

Gustin soil and similar inclusions—65 percent
Orford soil and similar inclusions—25 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Gustin—footslopes and concave side slopes; Orford—footslopes and convex side slopes
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 800 to 3,500 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, vine maple, and Oregon oxalis
Climatic factors:
Mean annual precipitation—55 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Gustin Soil

Typical profile

0 to 7 inches—very dark grayish brown and dark brown clay loam
7 to 24 inches—brown clay
24 to 46 inches—mottled, yellowish red clay
46 to 60 inches—mottled, grayish brown clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 12 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Orford Soil

Typical profile

0 to 9 inches—dark brown gravelly loam
9 to 42 inches—dark brown silty clay loam
42 to 60 inches—brown silty clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches
Shrink-swell potential: High

Contrasting Inclusions

- Kinney soils
- McDuff soils in convex, more steeply sloping positions
- Soils that are similar to the Gustin soil but are poorly drained or very poorly drained and are in concave positions and near drainageways
- Gustin and Orford soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Gustin and Orford

- Hazards of compaction and erosion
- Hazard of slope failure
- Plant competition
- Steepness of slope
- Low soil strength
- High shrink-swell potential

Gustin

- Wetness
- Hazard of windthrow
- Slow permeability

Orford

- Moderately slow permeability

Use and Management

Woodland

- Because the Gustin soil is unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the Gustin soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

91G—Harrington-Kilchis-Rock outcrop complex, 60 to 100 percent slopes

Composition

Harrington soil and similar inclusions—45 percent
Kilchis soil and similar inclusions—25 percent
Rock outcrop—20 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Harrington—side slopes; Kilchis and Rock outcrop—side slopes and headwalls
Parent material: Colluvium derived from volcanic rock
Elevation: 1,100 to 4,000 feet
Native plants: Douglas fir with an understory of common snowberry, cascade Oregongrape, creambush oceanspray, mountain brome, and western fescue
Climatic factors:
Mean annual precipitation—60 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Harrington Soil

Typical profile

0 to 5 inches—dark reddish brown very gravelly loam
5 to 28 inches—dark reddish brown very gravelly clay loam
28 to 34 inches—reddish brown extremely gravelly loam
34 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Kilchis Soil

Typical profile

0 to 10 inches—dark brown very cobbly loam
10 to 18 inches—brown very cobbly loam
18 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 12 to 20 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 1 inch

Rock Outcrop

Description: Areas of exposed bedrock

Contrasting Inclusions

- Klickitat soils
- Kinney soils in concave, less sloping positions
- Areas of talus below Rock outcrop
- Harrington soils that have slopes of less than 60 percent

Major Use

Woodland

Major Management Limitations

Harrington and Kilchis

- Steepness of slope
- Areas of Rock outcrop
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Seedling mortality
- Plant competition
- Depth to rock
- Hazard of fire damage

Kilchis

- Hazard of windthrow

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soils are dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- Avoiding areas with a high amount of Rock outcrop will minimize breakage of timber and increase the efficiency of yarding operations.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Providing artificial shade and leaving some of the larger trees to provide shade on the south- and west-facing slopes, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- On south- and west-facing slopes, increased erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees on the Kilchis soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

92A—Heceta fine sand, 0 to 2 percent slopes

Composition

Heceta soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Dunes
Landscape position: Interdunal swales and depressions
Parent material: Eolian sand
Elevation: 0 to 50 feet
Native plants: Shore pine, rushes, and sedges
Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—51 to 53 degrees F
Frost-free period—180 to 240 days

Typical Profile

0 to 2 inches—very dark grayish brown fine sand
2 to 60 inches—dark grayish brown fine sand

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Poorly drained
Depth to water table: 12 inches above the surface to a depth of 24 inches below the surface in October through May
Permeability: Rapid
Available water capacity: About 3.5 inches
Hazard of wind erosion: High

Contrasting Inclusions

- Duneland and Waldport soils in more steeply sloping positions

Major Uses

Recreation, wildlife habitat, and wetland management

Major Management Limitations

- Wetness
- Hazard of wind erosion
- Rapid permeability
- Coarse texture
- Droughtiness

Use and Management

Recreation

- Reduce the risk of wind erosion by maintaining plant

cover, revegetating disturbed areas as soon as possible, surfacing paths, and controlling traffic.
• Establish and maintain plant cover by fertilizing, seeding, and mulching and by shaping the slopes.
• Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.
• This soil generally is not suitable for septic tank absorption fields; however, areas of suitable included soils may be in the unit. Onsite investigation is needed to locate these areas.
• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

93C—Heceta-Waldport complex, 0 to 12 percent slopes

Composition

Heceta soil and similar inclusions—50 percent
Waldport soil, thin surface, and similar inclusions—40 percent
Contrasting inclusions—10 percent

Setting

Landform: Dunes
Landscape position: Heceta—interdunal swales and depressions with slopes of 2 percent or less; Waldport—recently stabilized dunes
Parent material: Eolian sand
Elevation: 0 to 50 feet
Native plants: Heceta—shore pine, European beachgrass, rushes, and sedges; Waldport—shore pine and European beachgrass
Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—51 to 53 degrees F
Frost-free period—200 to 260 days

Heceta Soil

Typical profile

0 to 2 inches—very dark grayish brown fine sand
2 to 60 inches—dark grayish brown fine sand

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Poorly drained
Permeability: Rapid
Available water capacity: About 3.5 inches
Depth to water table: 12 inches above the surface to a depth of 24 inches below the surface in October through May
Hazard of wind erosion: High

Waldport Soil, Thin Surface

Typical profile

0 to 2 inches—very dark grayish brown fine sand
2 to 63 inches—dark grayish brown fine sand

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: About 3.5 inches
Hazard of wind erosion: High

Contrasting Inclusions

• Duneland
• Waldport soils that have slopes of more than 12 percent

Major Uses

Recreation, wildlife habitat, and wetland management

Major Management Limitations

Heceta, and Waldport, thin surface

• Hazard of wind erosion
• Coarse texture
• Droughtiness

Heceta

• Wetness
• Rapid permeability

Waldport, thin surface

• Very rapid permeability

Use and Management

Recreation

• Reduce the risk of wind erosion by maintaining plant cover, revegetating disturbed areas as soon as possible, surfacing paths, and controlling traffic.
• Establish and maintain plant cover by fertilizing, seeding, and mulching and by shaping the slopes.
• Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.
• This unit generally is not suitable for septic tank absorption fields; however, areas of suitable soils may be in the unit. Onsite investigation is needed to locate these areas.
• Reduce wetness in the Heceta soil by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

94E—Hemcross-Klistan complex, 3 to 30 percent slopes

Composition

Hemcross soil and similar inclusions—45 percent
Klistan soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Plateaus
Landscape position: Broad ridges
Parent material: Colluvium and residuum derived from basalt
Elevation: 1,600 to 2,100 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and western swordfern
Climatic factors:
Mean annual precipitation—90 to 110 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—120 to 160 days

Hemcross Soil

Typical profile

0 to 11 inches—dark brown and dark reddish brown silt loam
11 to 44 inches—yellowish red and strong brown silt loam
44 to 60 inches—strong brown gravelly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 13 inches

Klistan Soil

Typical profile

0 to 7 inches—dark brown gravelly loam
7 to 25 inches—dark brown very gravelly loam
25 to 60 inches—brown very gravelly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 7 inches

Contrasting Inclusions

- Harslow soils in convex, more steeply sloping positions
- Hemcross and Klistan soils that are stony and are below areas of Rock outcrop
- Hemcross and Klistan soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Hemcross and Klistan

- Hazards of compaction and erosion
- Plant competition
- Steepness of slope

Klistan

- High amount of rock fragments in the soil

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Klistan soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

95F—Hilltish very gravelly sandy loam, 30 to 60 percent north slopes

Composition

Hilltish soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills and mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from conglomerate
Elevation: 700 to 2,900 feet

Native plants: Douglas fir and Pacific madrone with an understory of rose, western hazel, creambush oceanspray, and western fescue
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—50 to 54 degrees F
Frost-free period—150 to 200 days

Typical Profile

0 to 4 inches—dark brown very gravelly sandy loam
4 to 14 inches—brown very gravelly sandy loam
14 to 27 inches—brown and reddish yellow extremely cobbly sandy loam
27 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

- Josephine and Speaker soils
- Sutherlin soils in concave, less sloping positions
- Rock outcrop and McMullin soils in convex, more steeply sloping positions
- Chimneyrock soils in concave positions
- Hilltish soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Plant competition
- Seedling mortality
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

95G—Hilltish very gravelly sandy loam, 60 to 90 percent north slopes

Composition

Hilltish soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills and mountains
Landscape position: Side slopes
Parent material: Colluvium derived from conglomerate
Elevation: 700 to 2,900 feet
Native plants: Douglas fir and Pacific madrone with an understory of rose, western hazel, creambush oceanspray, and western fescue
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—50 to 54 degrees F
Frost-free period—150 to 200 days

Typical Profile

0 to 4 inches—dark brown very gravelly sandy loam
4 to 14 inches—brown very gravelly sandy loam
14 to 27 inches—brown and reddish yellow extremely cobbly sandy loam
27 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

- Speaker soils
- Rock outcrop and McMullin soils in convex, more steeply sloping positions
- Chimneyrock soils in concave positions
- Hilltish soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Plant competition
- Seedling mortality
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soil is dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

96F—Hilltish very gravelly sandy loam, 30 to 60 percent south slopes

Composition

Hilltish soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills and mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from conglomerate
Elevation: 700 to 2,900 feet
Native plants: Douglas fir and Pacific madrone with an understory of Pacific poison oak, canyon live oak, tall Oregongrape, and California fescue
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—50 to 54 degrees F
Frost-free period—150 to 200 days

Typical Profile

0 to 4 inches—dark brown very gravelly sandy loam
4 to 14 inches—brown very gravelly sandy loam
14 to 27 inches—brown and reddish yellow extremely cobbly sandy loam
27 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

- Josephine and Speaker soils
- Sutherlin soils in concave, less sloping positions
- Rock outcrop and McMullin soils in convex, more steeply sloping positions
- Chimneyrock soils in concave positions
- Hilltish soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazard of erosion

• High amount of rock fragments on the surface and in the soil
• Seedling mortality
• Plant competition
• Hazard of fire damage
• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

96G—Hilltish very gravelly sandy loam, 60 to 90 percent south slopes

Composition

Hilltish soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills and mountains
Landscape position: Side slopes
Parent material: Colluvium derived from conglomerate
Elevation: 700 to 2,900 feet
Native plants: Douglas fir and Pacific madrone with an understory of Pacific poison oak, canyon live oak, tall Oregongrape, and California fescue
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—50 to 54 degrees F
Frost-free period—150 to 200 days

Typical Profile

0 to 4 inches—dark brown very gravelly sandy loam
4 to 14 inches—brown very gravelly sandy loam
14 to 27 inches—brown and reddish yellow extremely cobbly sandy loam
27 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

• Speaker soils
• Rock outcrop and McMullin soils in convex, more steeply sloping positions
• Chimneyrock soils in concave positions
• Hilltish soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

• Steepness of slope
• Hazard of erosion
• High amount of rock fragments on the surface and in the soil
• Hazard of slope failure
• Seedling mortality
• Plant competition
• Hazard of fire damage
• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Highlead or other cable logging systems are best suited to this unit.
• When the soil is dry, landings can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.

- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

97E—Honeygrove gravelly clay loam, 3 to 30 percent slopes

Composition

Honeygrove soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Broad ridges and side slopes
Parent material: Residuum and colluvium derived from sandstone, siltstone, and volcanic rock
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 90 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—100 to 240 days

Typical Profile

0 to 12 inches—dark reddish brown gravelly clay loam
12 to 30 inches—dark reddish brown clay
30 to 63 inches—dark red clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Contrasting Inclusions

- Fernhaven, Kinney, and Preacher soils
- Bohannon, Digger, Klickitat, Harrington, and Peavine soils in convex, more steeply sloping positions
- Gustin soils in concave positions and near drainageways
- Honeygrove soils that have slopes of more than 30 percent

Major Uses

Woodland, and hay and pasture

Major Management Limitations

- Hazards of compaction and erosion
- Plant competition
- Steepness of slope
- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

97F—Honeygrove gravelly clay loam, 30 to 60 percent slopes

Composition

Honeygrove soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes and ridges
Parent material: Residuum and colluvium derived from sandstone, siltstone, and volcanic rock
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 90 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—100 to 240 days

Typical Profile

0 to 12 inches—dark reddish brown gravelly clay loam
12 to 30 inches—dark reddish brown clay
30 to 63 inches—dark red clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Contrasting Inclusions

- Fernhaven, Kinney, and Preacher soils
- Bohannon, Digger, Klickitat, Harrington, and Peavine soils in convex, more steeply sloping positions
- Shivigny soils in convex positions
- Gustin soils in concave, less sloping positions
- Honeygrove soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

98E—Honeygrove-Gustin complex, 3 to 30 percent slopes

Composition

Honeygrove soil and similar inclusions—45 percent
Gustin soil and similar inclusions—40 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Honeygrove—footslopes and convex side slopes; Gustin—footslopes and concave side slopes
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 800 to 3,200 feet
Native plants: Douglas fir and western hemlock with

an understory of salal, cascade Oregongrape, vine maple, and Oregon oxalis

Climatic factors:
Mean annual precipitation—55 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Honeygrove Soil

Typical profile

0 to 12 inches—dark reddish brown gravelly clay loam
12 to 30 inches—dark reddish brown clay
30 to 63 inches—dark red clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Gustin Soil

Typical profile

0 to 7 inches—very dark grayish brown and dark brown clay loam
7 to 24 inches—brown clay
24 to 46 inches—mottled, yellowish red clay
46 to 60 inches—mottled, grayish brown clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 12 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Kinney soils
- Klickitat, Peavine, and Shivigny soils in convex, more steeply sloping positions
- Soils that are similar to the Gustin soil but are poorly drained or very poorly drained and are in concave positions and near drainageways
- Honeygrove and Gustin soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Honeygrove and Gustin

- Hazards of compaction and erosion
- Hazard of slope failure
- Plant competition
- Steepness of slope
- Low soil strength

Honeygrove

- Moderately slow permeability

Gustin

- Wetness
- Hazard of windthrow
- High shrink-swell potential
- Slow permeability

Use and Management

Woodland

- Because the Gustin soil is unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the Gustin soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

99E—Honeygrove-Peavine complex, 3 to 30 percent slopes

Composition

Honeygrove soil and similar inclusions—45 percent
Peavine soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Broad ridges
Parent material: Residuum and colluvium derived from sandstone, siltstone, and volcanic rock
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 90 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Honeygrove Soil

Typical profile

0 to 12 inches—dark reddish brown gravelly clay loam
12 to 30 inches—dark reddish brown clay
30 to 63 inches—dark red clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Peavine Soil

Typical profile

0 to 5 inches—dark reddish brown silty clay loam
5 to 31 inches—dark reddish brown clay
31 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4.5 inches

Contrasting Inclusions

- Fernhaven and Preacher soils
- Bohannon and Digger soils in convex, more steeply sloping positions
- Soils that are similar to the Honeygrove soil but are poorly drained and are in concave positions and near drainageways
- Honeygrove and Peavine soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Honeygrove and Peavine

- Hazards of compaction and erosion
- Plant competition
- Steepness of slope
- Moderately slow permeability
- Low soil strength

Peavine

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the Peavine soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

99F—Honeygrove-Peavine complex, 30 to 60 percent slopes

Composition

Honeygrove soil and similar inclusions—40 percent
Peavine soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Honeygrove—concave side slopes; Peavine—convex side slopes and ridges

Parent material: Residuum and colluvium derived from sandstone, siltstone, and volcanic rock
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 90 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Honeygrove Soil

Typical profile

0 to 12 inches—dark reddish brown gravelly clay loam
12 to 30 inches—dark reddish brown clay
30 to 63 inches—dark red clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Peavine Soil

Typical profile

0 to 5 inches—dark reddish brown silty clay loam
5 to 31 inches—dark reddish brown clay
31 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4.5 inches

Contrasting Inclusions

- Fernhaven and Preacher soils
- Bohannon and Digger soils in convex, more steeply sloping positions
- Honeygrove and Peavine soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Honeygrove and Peavine

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Low soil strength

Peavine

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the Peavine soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

100E—Honeygrove-Shivigny complex, 3 to 30 percent slopes

Composition

Honeygrove soil and similar inclusions—55 percent
Shivigny soil and similar inclusions—35 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Honeygrove—concave side slopes; Shivigny—convex side slopes
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 800 to 3,200 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, vine maple, and crinkleawn fescue
Climatic factors:
Mean annual precipitation—55 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Honeygrove Soil

Typical profile

0 to 12 inches—dark reddish brown gravelly clay loam
12 to 30 inches—dark reddish brown clay
30 to 63 inches—dark red clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Shivigny Soil

Typical profile

0 to 10 inches—dark reddish brown very gravelly loam
10 to 21 inches—yellowish red very stony clay loam
21 to 64 inches—yellowish red very stony clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 6 inches

Contrasting Inclusions

- Kinney soils
- Gustin soils in concave positions and near drainageways
- Klickitat and Peavine soils in convex, more steeply sloping positions
- Honeygrove and Shivigny soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Honeygrove and Shivigny

- Hazards of compaction and erosion
- Plant competition
- Steepness of slope
- Moderately slow permeability
- Low soil strength

Shivigny

- High amount of rock fragments on the surface and in the soil

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Shivigny soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

101F—Honeygrove-Shivigny-Gustin complex, 30 to 60 percent north slopes

Composition

Honeygrove soil and similar inclusions—45 percent
Shivigny soil and similar inclusions—30 percent
Gustin soil and similar inclusions—15 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Honeygrove—side slopes; Shivigny—convex side slopes; Gustin—concave side slopes of less than 45 percent
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 800 to 3,200 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, vine maple, and Oregon oxalis
Climatic factors:
Mean annual precipitation—55 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Honeygrove Soil

Typical profile

0 to 12 inches—dark reddish brown gravelly clay loam
12 to 30 inches—dark reddish brown clay
30 to 63 inches—dark red clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Shivigny Soil

Typical profile

0 to 10 inches—dark reddish brown very gravelly loam
10 to 21 inches—yellowish red very stony clay loam
21 to 64 inches—yellowish red very stony clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 6 inches

Gustin Soil

Typical profile

0 to 7 inches—very dark grayish brown and dark brown clay loam
7 to 24 inches—brown clay
24 to 46 inches—mottled, yellowish red clay
46 to 60 inches—mottled, grayish brown clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 12 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

• Kinney soils
• Klickitat and Peavine soils in convex, more steeply sloping positions
• Honeygrove, Shivigny, and Gustin soils that have slopes of less than 30 percent
• Honeygrove and Shivigny soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Honeygrove, Shivigny, and Gustin

• Steepness of slope
• Hazards of erosion and compaction
• Hazard of slope failure
• Plant competition
• Low soil strength

Honeygrove

• Moderately slow permeability

Shivigny

• High amount of rock fragments on the surface and in the soil
• Moderately slow permeability

Gustin

• Wetness
• Hazard of windthrow
• High shrink-swell potential
• Slow permeability

Use and Management

Woodland

• Because the Gustin soil is unsuited to traffic when wet, use equipment only during dry periods.
• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on the Shivigny soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Trees on the Gustin soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

102F—Honeygrove-Shivigny-Gustin complex, 30 to 60 percent south slopes

Composition

Honeygrove soil and similar inclusions—45 percent
Shivigny soil and similar inclusions—30 percent
Gustin soil and similar inclusions—15 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Honeygrove—side slopes; Shivigny—convex side slopes; Gustin—concave side slopes of less than 45 percent
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 800 to 3,200 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, vine maple, and Oregon oxalis
Climatic factors:
Mean annual precipitation—55 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Honeygrove Soil

Typical profile

0 to 12 inches—dark reddish brown gravelly clay loam
12 to 30 inches—dark reddish brown clay
30 to 63 inches—dark red clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Shivigny Soil

Typical profile

0 to 10 inches—dark reddish brown very gravelly clay loam
10 to 21 inches—yellowish red very stony clay loam
21 to 64 inches—yellowish red very stony clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 6 inches

Gustin Soil

Typical profile

0 to 7 inches—very dark grayish brown and dark brown clay loam
7 to 24 inches—brown clay
24 to 46 inches—mottled, yellowish red clay
46 to 60 inches—mottled, grayish brown clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 12 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Kinney soils
- Klickitat and Peavine soils in convex, more steeply sloping positions
- Honeygrove, Shivigny, and Gustin soils that have slopes of less than 30 percent
- Honeygrove and Shivigny soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Honeygrove, Shivigny, and Gustin

- Steepness of slope
- Hazards of erosion and compaction
- Hazard of slope failure
- Plant competition
- Low soil strength

Honeygrove

- Moderately slow permeability

Shivigny

- High amount of rock fragments on the surface and in the soil
- Seedling mortality
- Moderately slow permeability

Gustin

- Wetness
- Hazard of windthrow
- High shrink-swell potential
- Slow permeability

Use and Management

Woodland

• Because the Gustin soil is unsuited to traffic when wet, use equipment only during dry periods.
• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on the Shivigny soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Providing artificial shade, leaving some of the larger trees to provide shade, avoiding very wet areas, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees on the Gustin soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

103G—Hummington very gravelly loam, 60 to 90 percent north slopes

Composition

Hummington soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from volcanic rock
Elevation: 3,800 to 4,800 feet
Native plants: Pacific silver fir and Douglas fir with an understory of Pacific rhododendron, big huckleberry, toothed pyrola, and vine maple
Climatic factors:
Mean annual precipitation—65 to 80 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Typical Profile

0 to 6 inches—very dark brown very gravelly loam
6 to 16 inches—very dark brown very gravelly loam
16 to 22 inches—very dark grayish brown extremely cobbly loam
22 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 6 inches

Contrasting Inclusions

• Rock outcrop in convex positions
• Soils that are similar to this Hummington soil but have bedrock at a depth of less than 20 inches and are in convex positions
• Oneonta soils in concave and less steeply sloping positions
• Soils that are similar to this Hummington soil but have bedrock at a depth of more than 40 inches and are in concave and less steeply sloping positions
• Hummington soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

• Steepness of slope
• Hazard of erosion
• High amount of rock fragments on the surface and in the soil
• Hazard of slope failure
• Plant competition
• Seedling mortality
• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soil is dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

104F—Illahee-Mellowmoon-Scaredman complex, 30 to 60 percent north slopes

Composition

Illahee soil and similar inclusions—35 percent
Mellowmoon soil and similar inclusions—30 percent
Scaredman soil and similar inclusions—25 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from volcanic rock
Elevation: 2,800 to 4,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, vine maple, Pacific rhododendron, and cascade Oregongrape
Climatic factors:
Mean annual precipitation—60 to 80 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Illahee Soil

Typical profile

0 to 10 inches—black very gravelly loam
10 to 47 inches—very dark brown to dark brown very gravelly loam
47 to 60 inches—dark yellowish brown very cobbly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 6 inches

Mellowmoon Soil

Typical profile

0 to 8 inches—dark brown gravelly loam
8 to 13 inches—dark brown loam
13 to 39 inches—dark yellowish brown clay loam
39 to 60 inches—dark yellowish brown gravelly clay loam and gravelly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 10.5 inches

Scaredman Soil

Typical profile

0 to 10 inches—very dark grayish brown extremely gravelly loam
10 to 17 inches—dark brown very gravelly loam
17 to 29 inches—dark yellowish brown very gravelly loam
29 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 2.5 inches

Contrasting Inclusions

- Rock outcrop and Limpy soils in convex, more steeply sloping positions

• Illahee and Mellowmoon soils that have slopes of less than 30 percent
• Illahee and Scaredman soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Illahee, Mellowmoon, and Scaredman

• Steepness of slope
• Hazard of erosion
• Plant competition

Illahee

• High amount of rock fragments on the surface and in the soil
• Seedling mortality

Scaredman

• High amount of rock fragments on the surface and in the soil
• Seedling mortality
• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on the Illahee and Scaredman soils do not respond well to seeding or mulching because of the large amount of exposed rock fragments and fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees on the Scaredman soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

105F—Illahee-Mellowmoon-Scaredman complex, 30 to 60 percent south slopes

Composition

Illahee soil and similar inclusions—35 percent
Mellowmoon soil and similar inclusions—30 percent
Scaredman soil and similar inclusions—25 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from volcanic rock
Elevation: 3,000 to 4,600 feet
Native plants: Douglas fir and western hemlock with an understory of salal, vine maple, Pacific rhododendron, and cascade Oregongrape
Climatic factors:
Mean annual precipitation—60 to 80 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Illahee Soil

Typical profile

0 to 10 inches—black very gravelly loam
10 to 47 inches—very dark brown to dark brown very gravelly loam
47 to 60 inches—dark yellowish brown very cobbly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 6 inches

Mellowmoon Soil

Typical profile

0 to 8 inches—dark brown gravelly loam
8 to 13 inches—dark brown loam
13 to 39 inches—dark yellowish brown clay loam
39 to 60 inches—dark yellowish brown gravelly clay loam and gravelly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained

Permeability: Moderate
Available water capacity: About 10.5 inches

Scaredman Soil

Typical profile

0 to 10 inches—very dark grayish brown extremely gravelly loam
10 to 17 inches—dark brown very gravelly loam
17 to 29 inches—dark yellowish brown very gravelly loam
29 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 2.5 inches

Contrasting Inclusions

- Rock outcrop and Limpy soils in convex, more steeply sloping positions
- Illahee and Mellowmoon soils that have slopes of less than 30 percent
- Illahee and Scaredman soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Illahee, Mellowmoon, and Scaredman

- Steepness of slope
- Hazard of erosion
- Plant competition

Illahee

- High amount of rock fragments on the surface and in the soil
- Seedling mortality

Scaredman

- High amount of rock fragments on the surface and in the soil
- Seedling mortality
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Illahee and Scaredman soils do not respond well to seeding or mulching because of the large amount of exposed rock fragments and fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the Scaredman soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

106G—Illahee-Rock outcrop complex, 60 to 90 percent north slopes

Composition

Illahee soil and similar inclusions—50 percent
Rock outcrop—25 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Illahee—side slopes; Rock outcrop—side slopes and headwalls
Parent material: Colluvium derived from volcanic rock
Elevation: 2,800 to 4,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, vine maple, Pacific rhododendron, and cascade Oregongrape
Climatic factors:
Mean annual precipitation—60 to 80 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Illahee Soil

Typical profile

0 to 10 inches—black very gravelly loam
10 to 47 inches—very dark brown to dark brown very gravelly loam
47 to 60 inches—dark yellowish brown very cobbly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 6 inches

Rock Outcrop

Description: Areas of exposed bedrock

Contrasting Inclusions

- Scaredman soils
- Limpy soils in convex positions
- Mellowmoon soils in concave, less sloping positions
- Illahee soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Areas of Rock outcrop
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Plant competition
- Seedling mortality

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soil is dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed rock fragments and fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- Avoiding areas with a high amount of Rock outcrop will minimize breakage of timber and increase the efficiency of yarding operations.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

107G—Illahee-Scaredman complex, 60 to 90 percent north slopes

Composition

Illahee soil and similar inclusions—40 percent
Scaredman soil and similar inclusions—40 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from volcanic rock
Elevation: 2,800 to 4,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, vine maple, Pacific rhododendron, and cascade Oregongrape
Climatic factors:
Mean annual precipitation—60 to 80 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Illahee Soil

Typical profile

0 to 10 inches—black very gravelly loam
10 to 47 inches—very dark brown to dark brown very gravelly loam
47 to 60 inches—dark yellowish brown very cobbly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 6 inches

Scaredman Soil

Typical profile

0 to 10 inches—very dark grayish brown extremely gravelly loam
10 to 17 inches—dark brown very gravelly loam
17 to 29 inches—dark yellowish brown very gravelly loam
29 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 2.5 inches

Contrasting Inclusions

• Rock outcrop and Limpy soils in convex positions
• Mellowmoon soils in concave, less sloping positions
• Illahee and Scaredman soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Illahee and Scaredman

• Steepness of slope
• Hazard of erosion
• High amount of rock fragments on the surface and in the soil
• Hazard of slope failure
• Plant competition
• Seedling mortality

Scaredman

• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Highlead or other cable logging systems are best suited to this unit.
• When the soils are dry, landings can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed rock fragments and fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Headwall areas should be avoided when constructing roads.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees on the Scaredman soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

108G—Illahee-Scaredman complex, 60 to 90 percent south slopes

Composition

Illahee soil and similar inclusions—40 percent
Scaredman soil and similar inclusions—40 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from volcanic rock
Elevation: 3,000 to 4,600 feet
Native plants: Douglas fir and western hemlock with an understory of salal, vine maple, Pacific rhododendron, and cascade Oregongrape
Climatic factors:
Mean annual precipitation—60 to 80 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Illahee Soil

Typical profile

0 to 10 inches—black very gravelly loam
10 to 47 inches—very dark brown to dark brown very gravelly loam
47 to 60 inches—dark yellowish brown very cobbly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 6 inches

Scaredman Soil

Typical profile

0 to 10 inches—very dark grayish brown extremely gravelly loam
10 to 17 inches—dark brown very gravelly loam
17 to 29 inches—dark yellowish brown very gravelly loam
29 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 2.5 inches

Contrasting Inclusions

- Rock outcrop and Limpy soils in convex positions
- Mellowmoon soils in concave, less sloping positions
- Illahee and Scaredman soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Illahee and Scaredman

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Seedling mortality
- Plant competition

Scaredman

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soils are dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed rock fragments and fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the Scaredman soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

109E—Jayar very gravelly loam, 12 to 30 percent slopes

Composition

Jayar soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Ridges
Parent material: Colluvium derived from metamorphic rock
Elevation: 3,800 to 5,000 feet
Native plants: Douglas fir and white fir with an understory of cascade Oregongrape, creambush oceanspray, western swordfern, and western princes pine
Climatic factors:
Mean annual precipitation—50 to 60 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Typical Profile

0 to 3 inches—very dark brown very gravelly loam
3 to 15 inches—dark brown very gravelly loam
15 to 26 inches—dark yellowish brown very gravelly loam
26 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 3 inches

Contrasting Inclusions

- Rock outcrop in convex positions
- Soils that are similar to this Jayar soil but have bedrock at a depth of less than 20 inches and are in convex positions
- Soils that are similar to this Jayar soil but are influenced by serpentinite

- Soils that are similar to this Jayar soil but have bedrock at a depth of more than 40 inches and are in concave positions
- Soils that are similar to this Jayar soil but have less than 35 percent rock fragments
- Jayar soils that have slopes of less than 12 percent or more than 30 percent

Major Use

Woodland

Major Management Limitations

- Hazards of erosion and compaction
- High amount of rock fragments on the surface and in the soil
- Steepness of slope
- Plant competition
- Seedling mortality
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

110F—Jayar very gravelly loam, 30 to 70 percent north slopes

Composition

Jayar soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from metamorphic rock
Elevation: 3,800 to 5,000 feet
Native plants: Douglas fir and white fir with an understory of cascade Oregongrape, creambush oceanspray, western swordfern, and western princes pine
Climatic factors:
Mean annual precipitation—50 to 60 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Typical Profile

0 to 3 inches—very dark brown very gravelly loam
3 to 15 inches—dark brown very gravelly loam
15 to 26 inches—dark yellowish brown very gravelly loam
26 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 3 inches

Contrasting Inclusions

- Rock outcrop in convex positions
- Soils that are similar to this Jayar soil but have bedrock at a depth of less than 20 inches and are in convex positions
- Soils that are similar to this Jayar soil but are influenced by serpentinite
- Soils that are similar to this Jayar soil but have bedrock at a depth of more than 40 inches and are in concave, less sloping positions
- Soils that are similar to this Jayar soil but have less than 35 percent rock fragments

- Jayar soils that have slopes of less than 30 percent or more than 70 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Plant competition
- Seedling mortality
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

111F—Jayar very gravelly loam, 30 to 70 percent south slopes

Composition

Jayar soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from metamorphic rock
Elevation: 3,800 to 5,000 feet
Native plants: Douglas fir and white fir with an understory of cascade Oregongrape, creambush oceanspray, western swordfern, and western princes pine
Climatic factors:
Mean annual precipitation—50 to 60 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Typical Profile

0 to 3 inches—very dark brown very gravelly loam
3 to 15 inches—dark brown very gravelly loam
15 to 26 inches—dark yellowish brown very gravelly loam
26 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 3 inches

Contrasting Inclusions

- Rock outcrop in convex positions
- Soils that are similar to this Jayar soil but have bedrock at a depth of less than 20 inches and are in convex positions
- Soils that are similar to this Jayar soil but are influenced by serpentinite
- Soils that are similar to this Jayar soil but have bedrock at a depth of more than 40 inches and are in concave, less sloping positions
- Soils that are similar to this Jayar soil but have less than 35 percent rock fragments
- Jayar soils that have slopes of less than 30 percent or more than 70 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Seedling mortality
- Plant competition
- Hazard of fire damage
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

112A—Jimbo-Haflinger complex, 0 to 3 percent slopes

Composition

Jimbo soil and similar inclusions—45 percent
Haflinger soil and similar inclusions—35 percent
Contrasting inclusions—20 percent

Setting

Landform: Flood plains
Landscape position: High flood plains
Parent material: Mixed alluvium
Elevation: 1,100 to 1,200 feet
Native plants: Douglas fir and bigleaf maple with an understory of salal, cascade Oregongrape, vine maple, and western swordfern
Climatic factors:
Mean annual precipitation—55 to 65 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Jimbo Soil

Typical profile

0 to 10 inches—very dark brown fine sandy loam
10 to 35 inches—very dark grayish brown and brown fine sandy loam
35 to 60 inches—brown gravelly sand

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 6.5 inches
Frequency of flooding: Rare

Haflinger Soil

Typical profile

0 to 3 inches—very dark grayish brown cobbly sandy loam
3 to 10 inches—very dark grayish brown and dark brown cobbly sandy loam
10 to 60 inches—dark brown extremely cobbly sand

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Excessively drained
Permeability: Moderately rapid
Available water capacity: About 3 inches
Frequency of flooding: Rare

Contrasting Inclusions

- Soils that are similar to the Jimbo and Haflinger soils but are on lower flood plains

• Soils that are similar to the Jimbo soil but are not flooded

Major Uses

Hay and pasture, and wildlife habitat

Major Management Limitations

Jimbo and Haflinger

• Hazard of flooding
• Hazard of compaction
• Rapid permeability of the substratum

Haflinger

• High amount of rock fragments in the soil
• Droughtiness

Use and Management

Hay and pasture

• Maintain fertility and tilth by growing green manure crops, returning crop residue to the soils, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Reduce the risk of erosion by providing structures along streambanks to control the flow of water and by planting cover crops.
• Reduce the risk of compaction of the surface layer by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

113C—Jory silty clay loam, 2 to 12 percent slopes

Composition

Jory soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Toeslopes and broad ridges
Parent material: Residuum and colluvium derived from basalt
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 225 days

Typical Profile

0 to 16 inches—dark reddish brown silty clay loam
16 to 24 inches—dark reddish brown silty clay
24 to 60 inches—dark red silty clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

• Nekia soils in convex, more steeply sloping positions
• Yoncalla soils in concave positions and near drainageways
• Jory soils that have slopes of more than 12 percent

Major Uses

Cropland, pasture, woodland, and homesite development

Major Management Limitations

• Hazards of compaction and erosion
• Plant competition
• Moderately slow permeability
• Low soil strength

Use and Management

Cropland

• Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.

• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

• Use conventional equipment in harvesting, but limit its use when the soil is wet.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Roads should be designed to offset the limited ability of the soil to support a load.
• Seed cuts and fills to permanent vegetation.

113D—Jory silty clay loam, 12 to 20 percent slopes

Composition

Jory soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Footslopes and broad ridges
Parent material: Residuum and colluvium derived from basalt
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 225 days

Typical Profile

0 to 16 inches—dark reddish brown silty clay loam
16 to 24 inches—dark reddish brown silty clay
24 to 60 inches—dark red silty clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

• Nekia soils in convex, more steeply sloping positions
• Yoncalla soils in concave positions and near drainageways
• Jory soils that have slopes of less than 12 percent or more than 20 percent

Major Uses

Cropland, pasture, woodland, and homesite development

Major Management Limitations

• Hazards of erosion and compaction
• Steepness of slope
• Plant competition
• Moderately slow permeability
• Low soil strength

Use and Management

Cropland

• Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system

that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

- Use conventional equipment in harvesting, but limit its use when the soil is wet.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the limited ability of the soil to support a load.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

113E—Jory silty clay loam, 20 to 30 percent slopes

Composition

Jory soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes and broad ridges
Parent material: Residuum and colluvium derived from basalt
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 225 days

Typical Profile

0 to 16 inches—dark reddish brown silty clay loam
16 to 24 inches—dark reddish brown silty clay
24 to 60 inches—dark red silty clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

- Nekia and Ritner soils in convex, more steeply sloping positions
- Yoncalla soils in concave positions and near drainageways
- Jory soils that have slopes of less than 20 percent or more than 30 percent

Major Uses

Woodland, cropland, pasture, and homesite development

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but

cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Cropland

• Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Roads should be designed to offset the limited ability of the soil to support a load.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

113F—Jory silty clay loam, 30 to 60 percent slopes

Composition

Jory soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes and ridges
Parent material: Residuum and colluvium derived from basalt
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 225 days

Typical Profile

0 to 16 inches—dark reddish brown silty clay loam
16 to 24 inches—dark reddish brown silty clay
24 to 60 inches—dark red silty clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

• Nekia soils in convex positions
• Ritner soils in convex, more steeply sloping positions
• Yoncalla soils in concave, less sloping positions
• Jory soils that have slopes of less than 30 percent or more than 60 percent

Major Uses

Woodland and pasture

Major Management Limitations

• Steepness of slope
• Hazards of erosion and compaction
• Plant competition

- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.
- Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

114F—Jory-Ritner complex, 30 to 60 percent slopes

Composition

Jory soil and similar inclusions—45 percent
Ritner soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Jory—concave side slopes; Ritner—convex side slopes and ridges
Parent material: Colluvium derived from basalt
Elevation: 600 to 2,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 225 days

Jory Soil

Typical profile

0 to 16 inches—dark reddish brown silty clay loam
16 to 24 inches—dark reddish brown silty clay
24 to 60 inches—dark red silty clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Ritner Soil

Typical profile

0 to 9 inches—dark reddish brown gravelly silty clay loam
9 to 23 inches—dark reddish brown very gravelly silty clay
23 to 34 inches—dark reddish brown very cobbly silty clay
34 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4.5 inches

Contrasting Inclusions

- Nekia soils in convex positions
- Yoncalla soils in concave, less sloping positions
- Sahaptin soils in convex, more steeply sloping positions
- Jory and Ritner soils that have slopes of less than 30 percent or more than 60 percent

Major Uses

Woodland, and source of quarry rock, particularly the Ritner soil

Major Management Limitations

Jory and Ritner

- Steepness of slope
- Hazards of erosion and compaction

- Plant competition
- Moderately slow permeability

Jory

- Low soil strength

Ritner

- High amount of rock fragments in the soil
- Seedling mortality
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Ritner soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees on the Ritner soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

115C—Josephine gravelly loam, 3 to 12 percent slopes

Composition

Josephine soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Toeslopes
Parent material: Residuum and colluvium derived from sandstone, siltstone, and metamorphic rock
Elevation: 500 to 3,000 feet
Native plants: Douglas fir and ponderosa pine with an understory of tall Oregongrape, common snowberry, whipplevine, and western fescue
Climatic factors:
Mean annual precipitation—35 to 50 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 200 days

Typical Profile

0 to 5 inches—dark brown gravelly loam
5 to 22 inches—yellowish red gravelly loam
22 to 59 inches—yellowish red gravelly clay loam
59 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 7 inches

Contrasting Inclusions

- Pollard soils
- Speaker soils in convex, more steeply sloping positions
- Soils that are similar to this Josephine soil but have more than 35 percent rock fragments
- Sutherlin, Pengra, and Veneta soils in concave positions and near drainageways
- Josephine soils that have slopes of more than 12 percent

Major Uses

Woodland, hay and pasture, and homesite development

Major Management Limitations

- Hazards of compaction and erosion
- Plant competition
- Moderately slow permeability

Use and Management

Woodland

- Use conventional equipment in harvesting, but limit its use when the soil is wet.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.

• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Hay and pasture

• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Seed cuts and fills to permanent vegetation.

115E—Josephine gravelly loam, 12 to 30 percent slopes

Composition

Josephine soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Footslopes and ridges
Parent material: Residuum and colluvium derived from sandstone, siltstone, and metamorphic rock
Elevation: 500 to 3,000 feet
Native plants: Douglas fir and ponderosa pine with an understory of tall Oregongrape, common snowberry, whipplevine, and western fescue
Climatic factors:
Mean annual precipitation—35 to 50 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 200 days

Typical Profile

0 to 5 inches—dark brown gravelly loam
5 to 22 inches—yellowish red gravelly loam
22 to 59 inches—yellowish red gravelly clay loam
59 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 7 inches

Contrasting Inclusions

• Pollard soils
• Speaker soils in convex, more steeply sloping positions
• Soils that are similar to this Josephine soil but have more than 35 percent rock fragments
• Sutherlin, Pengra, and Veneta soils in concave positions and near drainageways
• Josephine soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Woodland, hay and pasture, and homesite development

Major Management Limitations

• Hazards of erosion and compaction
• Steepness of slope
• Plant competition
• Moderately slow permeability

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.

• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Hay and pasture

• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Tillage and seeding should be done on the contour or across the slope where practical.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

116F—Josephine-Speaker complex, 30 to 60 percent north slopes

Composition

Josephine soil and similar inclusions—55 percent
Speaker soil and similar inclusions—30 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Josephine—concave side slopes; Speaker—convex side slopes
Parent material: Residuum and colluvium derived from sandstone, siltstone, and metamorphic rock
Elevation: 600 to 4,000 feet
Native plants: Douglas fir and Pacific madrone with an understory of western swordfern, common snowberry, creambush oceanspray, and western fescue
Climatic factors:
Mean annual precipitation—35 to 50 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 200 days

Josephine Soil

Typical profile

0 to 5 inches—dark brown gravelly loam
5 to 22 inches—yellowish red gravelly loam
22 to 59 inches—yellowish red gravelly clay loam
59 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 7 inches

Speaker Soil

Typical profile

0 to 10 inches—dark brown loam
10 to 25 inches—dark brown loam
25 to 31 inches—strong brown gravelly clay loam
31 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5 inches

Contrasting Inclusions

• Pollard, Sutherlin, and Veneta soils in concave, less sloping positions
• Beekman and Vermisa soils in convex, more steeply sloping positions
• Dubakella and Pearsoll soils in areas of serpentinite and peridotite
• Soils that are similar to the Josephine soil but have more than 35 percent rock fragments
• Josephine and Speaker soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Josephine and Speaker

• Steepness of slope
• Hazards of erosion and compaction

- Plant competition
- Moderately slow permeability

Speaker

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees on the Speaker soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

117F—Josephine-Speaker complex, 30 to 60 percent south slopes

Composition

Josephine soil and similar inclusions—45 percent
Speaker soil and similar inclusions—40 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Josephine—concave side slopes; Speaker—convex side slopes
Parent material: Residuum and colluvium derived from sandstone, siltstone, and metamorphic rock
Elevation: 600 to 4,000 feet
Native plants: Douglas fir and ponderosa pine with an understory of tall Oregongrape, whipplevine, common snowberry, and California fescue
Climatic factors:
Mean annual precipitation—35 to 50 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 200 days

Josephine Soil

Typical profile

0 to 5 inches—dark brown gravelly loam
5 to 22 inches—yellowish red gravelly loam
22 to 59 inches—yellowish red gravelly clay loam
59 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 7 inches

Speaker Soil

Typical profile

0 to 10 inches—dark brown loam
10 to 25 inches—dark brown loam
25 to 31 inches—strong brown gravelly clay loam
31 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5 inches

Contrasting Inclusions

- Pollard, Sutherlin, and Veneta soils in concave, less sloping positions
- Beekman and Vermisa soils in convex, more steeply sloping positions
- Dubakella and Pearsoll soils in areas of serpentinite and peridotite
- Soils that are similar to this Josephine soil but have more than 35 percent rock fragments
- Josephine and Speaker soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Josephine and Speaker

- Steepness of slope
- Hazards of erosion and compaction
- Seedling mortality
- Plant competition
- Moderately slow permeability

Speaker

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees on the Speaker soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

118E—Kanid very gravelly loam, 12 to 30 percent slopes

Composition

Kanid soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Footslopes and ridges
Parent material: Colluvium derived from sandstone
Elevation: 300 to 3,200 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 6 inches—very dark grayish brown very gravelly loam
6 to 19 inches—brown extremely gravelly loam
19 to 48 inches—dark yellowish brown and dark brown very gravelly clay loam
48 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Contrasting Inclusions

- Rosehaven soils in concave positions
- Atring and Larmine soils and Rock outcrop in convex, more steeply sloping positions
- Kanid soils that have an extremely gravelly or extremely cobbly surface layer and are below areas of Rock outcrop
- Kanid soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Steepness of slope
- Plant competition
- Seedling mortality

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding

or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

118F—Kanid very gravelly loam, 30 to 70 percent slopes

Composition

Kanid soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes and ridges
Parent material: Colluvium derived from sandstone
Elevation: 300 to 3,200 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 6 inches—very dark grayish brown very gravelly loam
6 to 19 inches—brown extremely gravelly loam
19 to 48 inches—dark yellowish brown and dark brown very gravelly clay loam
48 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Contrasting Inclusions

- Rosehaven soils
- Atring and Larmine soils and Rock outcrop in convex, more steeply sloping positions
- Kanid soils that have an extremely gravelly or extremely cobbly surface layer and are below areas of Rock outcrop
- Kanid soils that have slopes of less than 30 percent or more than 70 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Plant competition
- Seedling mortality

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

119F—Kanid-Atring complex, 30 to 60 percent south slopes

Composition

Kanid soil and similar inclusions—45 percent

Atring soil and similar inclusions—35 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from metamorphic rock
Elevation: 1,000 to 4,000 feet
Native plants: Douglas fir and Pacific madrone with an understory of creambush oceanspray, cascade Oregongrape, whipplevine, and mountain brome
Climatic factors:
Mean annual precipitation—40 to 60 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Kanid Soil

Typical profile

0 to 6 inches—very dark grayish brown very gravelly loam
6 to 19 inches—brown extremely gravelly loam
19 to 48 inches—dark yellowish brown and dark brown very gravelly clay loam
48 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 5.5 inches

Atring Soil

Typical profile

0 to 9 inches—very dark brown very gravelly loam
9 to 39 inches—brown very gravelly loam
39 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

- Norling soils
- McMullin, Reston, and Vermisa soils and Rock outcrop in convex, more steeply sloping positions
- Acker and Dumont soils in concave, less sloping positions
- Kanid and Atring soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Kanid and Atring

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Seedling mortality
- Plant competition

Atring

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Atring soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees on the Atring soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

119G—Kanid-Atring complex, 60 to 90 percent south slopes

Composition

Kanid soil and similar inclusions—45 percent

Atring soil and similar inclusions—35 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from metamorphic rock
Elevation: 1,000 to 4,000 feet
Native plants: Douglas fir and Pacific madrone with an understory of creambush oceanspray, cascade Oregongrape, whipplevine, and mountain brome
Climatic factors:
Mean annual precipitation—40 to 60 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Kanid Soil

Typical profile

0 to 6 inches—very dark grayish brown very gravelly loam
6 to 19 inches—brown extremely gravelly loam
19 to 48 inches—dark yellowish brown and dark brown very gravelly clay loam
48 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 5.5 inches

Atring Soil

Typical profile

0 to 9 inches—very dark brown very gravelly loam
9 to 39 inches—brown very gravelly loam
39 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

- Norling soils
- Acker soils in concave, less sloping positions
- McMullin, Reston, and Vermisa soils and Rock outcrop in convex, more steeply sloping positions
- Dubakella and Pearsoll soils underlain by serpentinite and peridotite
- Kanid and Atring soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Kanid and Atring

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Seedling mortality
- Plant competition

Atring

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soils are dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on the Atring soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees on the Atring soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

120G—Kanid-Atring complex, 60 to 90 percent north slopes

Composition

Kanid soil and similar inclusions—45 percent
Atring soil and similar inclusions—35 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from metamorphic rock
Elevation: 1,000 to 4,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, cascade Oregongrape, and western swordfern
Climatic factors:
Mean annual precipitation—40 to 60 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Kanid Soil

Typical profile

0 to 6 inches—very dark grayish brown very gravelly loam
6 to 19 inches—brown extremely gravelly loam
19 to 48 inches—dark yellowish brown and dark brown very gravelly clay loam
48 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 5.5 inches

Atring Soil

Typical profile

0 to 9 inches—very dark brown very gravelly loam
9 to 39 inches—brown very gravelly loam
39 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

- Norling soils
- Acker soils in concave, less sloping positions
- McMullin, Reston, and Vermisa soils and Rock outcrop in convex, more steeply sloping positions
- Dubakella and Pearsoll soils underlain by serpentinite and peridotite
- Kanid and Atring soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Kanid and Atring

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Plant competition
- Seedling mortality

Atring

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit (fig. 9).
- When the soils are dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on the Atring soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

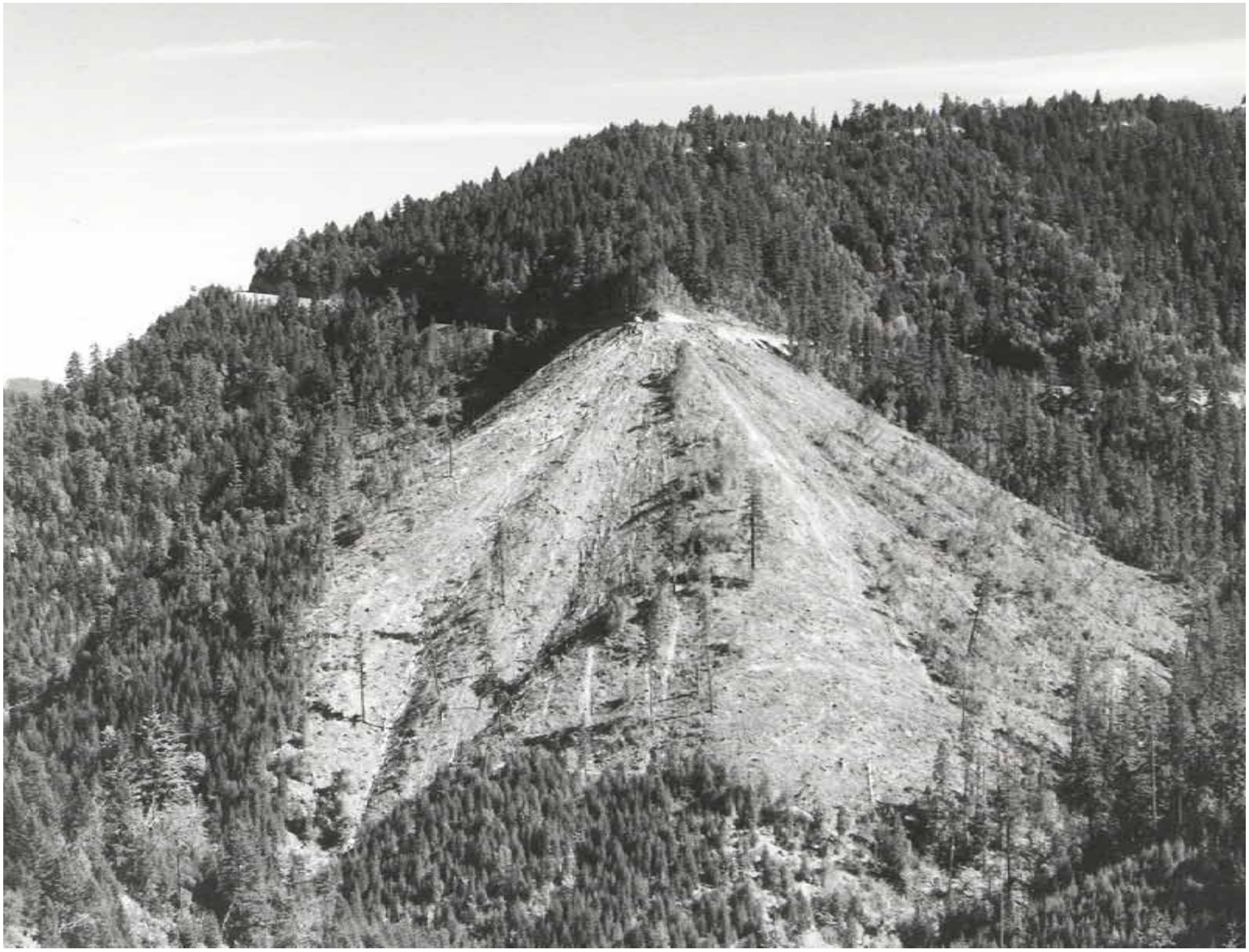


Figure 9.—Highlead logging in an area of Kanid-Atring complex, 60 to 90 percent north slopes.

• Trees on the Atring soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

121G—Kilchis-Harslow-Rock outcrop complex, 60 to 100 percent south slopes

Composition

Kilchis soil and similar inclusions—30 percent
Harslow soil and similar inclusions—30 percent
Rock outcrop—25 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Side slopes and headwalls
Parent material: Colluvium derived from basalt
Elevation: 1,500 to 2,250 feet
Native plants: Douglas fir and bigleaf maple with an understory of creambush oceanspray, vine maple, whipplevine, and common snowberry
Climatic factors:
Mean annual precipitation—90 to 110 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—120 to 160 days

Kilchis Soil

Typical profile

0 to 10 inches—dark brown very cobbly loam
10 to 18 inches—brown very cobbly loam
18 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 12 to 20 inches

Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 1 inch

Harslow Soil

Typical profile

0 to 10 inches—dark brown very gravelly loam
10 to 25 inches—dark brown very gravelly loam and extremely gravelly loam
25 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 4 inches

Rock outcrop

Description: Areas of exposed bedrock

Contrasting Inclusions

- Soils that are similar to the Harslow soil but are more than 40 inches deep to bedrock
- Areas of talus below areas of Rock outcrop
- Kilchis and Harslow soils that have slopes of less than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Areas of Rock outcrop
- Hazard of erosion
- Hazard of slope failure
- High amount of rock fragments on the surface and in the soil
- Hazard of windthrow
- Depth to rock
- Seedling mortality
- Plant competition

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soils are dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- Avoiding areas with a high amount of Rock outcrop will minimize breakage of timber and increase the efficiency of yarding operations.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

122E—Kinney-Klickitat complex, 3 to 30 percent slopes

Composition

Kinney soil and similar inclusions—60 percent
Klickitat soil and similar inclusions—20 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Ridges and side slopes
Parent material: Colluvium and residuum derived from volcanic rock
Elevation: 1,100 to 4,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, vine maple, and red huckleberry
Climatic factors:
Mean annual precipitation—55 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Kinney Soil

Typical profile

0 to 14 inches—very dark grayish brown and dark brown gravelly loam
14 to 44 inches—dark brown clay loam
44 to 60 inches—dark yellowish brown gravelly clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 10.5 inches

Klickitat Soil

Typical profile

0 to 11 inches—dark reddish brown extremely gravelly loam
11 to 38 inches—dark brown and strong brown very gravelly loam
38 to 60 inches—yellowish red and strong brown very gravelly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5.5 inches

Contrasting Inclusions

- Honeygrove and Orford soils
- Harrington soils in convex, more steeply sloping positions
- Gustin soils in concave positions and near drainageways
- Kinney and Klickitat soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Kinney and Klickitat

- Hazard of erosion
- Plant competition
- Steepness of slope

Klickitat

- High amount of rock fragments on the surface and in the soil
- Seedling mortality

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Klickitat soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

123A—Kirkendall-Nekoma complex, 0 to 3 percent slopes

Composition

Kirkendall soil and similar inclusions—45 percent
Nekoma soil and similar inclusions—35 percent
Contrasting inclusions—20 percent

Setting

Landform: Flood plains
Landscape position: Kirkendall—intermediate flood plains; Nekoma—low flood plains
Parent material: Mixed alluvium
Elevation: 20 to 1,000 feet
Native plants: Douglas fir, red alder, and bigleaf maple with an understory of vine maple, creambush oceanspray, and western swordfern
Climatic factors:
Mean annual precipitation—60 to 90 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—160 to 240 days

Kirkendall Soil

Typical profile

0 to 10 inches—very dark brown silt loam
10 to 19 inches—dark brown silt loam
19 to 37 inches—dark yellowish brown silty clay loam
37 to 63 inches—dark yellowish brown silty clay loam and silt loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Depth to water table: 30 to 72 inches in November through April
Permeability: Moderately slow

Available water capacity: About 11 inches
Frequency of flooding: Occasional in December through March

Nekoma Soil

Typical profile

0 to 14 inches—very dark brown and dark brown silt loam
14 to 27 inches—dark yellowish brown silt loam
27 to 32 inches—dark yellowish brown very fine sandy loam
32 to 60 inches—dark yellowish brown fine sand

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Depth to water table: 48 to 72 inches in November through April
Permeability: Moderate
Available water capacity: About 8 inches
Frequency of flooding: Frequent in December through March

Contrasting Inclusions

- Quosatana and Wasson soils in swales
- Wintley soils on terraces

Major Uses

Woodland, hay and pasture, and wildlife habitat

Major Management Limitations

Kirkendall and Nekoma

- Hazard of flooding
- Hazard of compaction
- Plant competition

Kirkendall

- Wetness
- Moderately slow permeability
- Low soil strength

Nekoma

- Coarse texture

Use and Management

Woodland

- Use conventional equipment in harvesting, but limit its use to periods when the soils are wet.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, skid trails, and landings.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

Hay and pasture

- Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Reduce the risk of erosion by providing structures along streambanks to control the flow of water and by planting cover crops.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

124F—Klickitat-Harrington complex, 30 to 60 percent north slopes

Composition

Klickitat soil and similar inclusions—50 percent
Harrington soil and similar inclusions—35 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Side slopes and ridges
Parent material: Colluvium derived from volcanic rock
Elevation: 1,100 to 4,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, vine maple, and western hazel
Climatic factors:
Mean annual precipitation—55 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Klickitat Soil

Typical profile

0 to 11 inches—dark reddish brown extremely gravelly loam
11 to 38 inches—dark brown and strong brown very gravelly loam
38 to 60 inches—yellowish red and strong brown very gravelly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5.5 inches

Harrington Soil

Typical profile

0 to 5 inches—dark reddish brown very gravelly loam
5 to 28 inches—dark reddish brown very gravelly clay loam
28 to 34 inches—reddish brown extremely gravelly loam
34 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

- Rock outcrop and Kilchis soils in convex, more steeply sloping positions
- Honeygrove, Kinney, and Orford soils in concave, less sloping positions
- Klickitat and Harrington soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Klickitat and Harrington

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Plant competition
- Seedling mortality

Harrington

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Harrington soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments and fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Providing artificial shade and leaving some of the larger trees to provide shade on south- and west-facing slopes, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure establishment and survival of seedlings.
- Trees on the Harrington soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

124G—Klickitat-Harrington complex, 60 to 90 percent north slopes

Composition

Klickitat soil and similar inclusions—55 percent
Harrington soil and similar inclusions—35 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from volcanic rock
Elevation: 1,100 to 4,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, vine maple, and western hazel
Climatic factors:
Mean annual precipitation—55 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Klickitat Soil

Typical profile

0 to 11 inches—dark reddish brown extremely gravelly loam
11 to 38 inches—dark brown and strong brown very gravelly loam
38 to 60 inches—yellowish red and strong brown very gravelly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5.5 inches

Harrington Soil

Typical profile

0 to 5 inches—dark reddish brown very gravelly loam
5 to 28 inches—dark reddish brown very gravelly clay loam
28 to 34 inches—reddish brown extremely gravelly loam
34 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

• Rock outcrop and Kilchis soils in convex, more steeply sloping positions
• Kinney soils in concave, less sloping positions
• Klickitat and Harrington soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Klickitat and Harrington

• Steepness of slope
• Hazard of erosion
• High amount of rock fragments on the surface and in the soil
• Hazard of slope failure
• Plant competition
• Seedling mortality

Harrington

• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Highlead or other cable logging systems are best suited to this unit.
• When the soils are dry, landings can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
• Roadcuts on the Harrington soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Headwall areas should be avoided when constructing roads.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees on the Harrington soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

125G—Klickitat-Harrington complex, 60 to 90 percent south slopes

Composition

Klickitat soil and similar inclusions—50 percent
Harrington soil and similar inclusions—40 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from volcanic rock
Elevation: 1,100 to 4,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, vine maple, and western hazel
Climatic factors:
Mean annual precipitation—55 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Klickitat Soil

Typical profile

0 to 11 inches—dark reddish brown extremely gravelly loam
11 to 38 inches—dark brown and strong brown very gravelly loam
38 to 60 inches—yellowish red and strong brown very gravelly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5.5 inches

Harrington Soil

Typical profile

0 to 5 inches—dark reddish brown very gravelly loam
5 to 28 inches—dark reddish brown very gravelly clay loam
28 to 34 inches—reddish brown extremely gravelly loam
34 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

- Rock outcrop and Kilchis soils in convex, more steeply sloping positions
- Kinney soils in concave, less sloping positions
- Klickitat and Harrington soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Klickitat and Harrington

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Seedling mortality
- Plant competition

Harrington

- Hazard of windthrow
- Depth to rock
- Hazard of fire damage

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soils are dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on the Harrington soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- On the Harrington soil, an increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees on the Harrington soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

126F—Klickitat-Kinney complex, 30 to 60 percent slopes

Composition

Klickitat soil and similar inclusions—45 percent
Kinney soil and similar inclusions—35 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes and ridges
Parent material: Colluvium and residuum derived from volcanic rock
Elevation: 1,100 to 4,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, vine maple, and red huckleberry

Climatic factors:
Mean annual precipitation—55 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Klickitat Soil

Typical profile

0 to 11 inches—dark reddish brown extremely gravelly loam
11 to 38 inches—dark brown and strong brown very gravelly loam
38 to 60 inches—yellowish red and strong brown very gravelly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5.5 inches

Kinney Soil

Typical profile

0 to 14 inches—very dark grayish brown and dark brown gravelly loam
14 to 44 inches—dark brown clay loam
44 to 60 inches—dark yellowish brown gravelly clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 10.5 inches

Contrasting Inclusions

- Honeygrove and Orford soils in concave, less sloping positions
- Harrington and Kilchis soils in convex, more steeply sloping positions
- Kinney and Klickitat soils that have slopes of less than 30 percent
- Klickitat soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Klickitat and Kinney

- Steepness of slope
- Hazard of erosion
- Plant competition

Klickitat

- High amount of rock fragments on the surface and in the soil
- Seedling mortality

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Klickitat soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Providing artificial shade and leaving some of the larger trees to provide shade on south- and west-facing slopes, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

127F—Klistan-Hemcross complex, 30 to 60 percent slopes

Composition

Klistan soil and similar inclusions—45 percent
Hemcross soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from basalt
Elevation: 1,600 to 2,100 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and western swordfern
Climatic factors:
Mean annual precipitation—90 to 110 inches

Mean annual air temperature—45 to 50 degrees F
Frost-free period—120 to 160 days

Klistan Soil

Typical profile

0 to 7 inches—dark brown gravelly loam
7 to 25 inches—dark brown very gravelly loam
25 to 60 inches—brown very gravelly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 7 inches

Hemcross Soil

Typical profile

0 to 11 inches—dark brown and dark reddish brown silt loam
11 to 44 inches—yellowish red and strong brown silt loam
44 to 60 inches—strong brown gravelly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 13 inches

Contrasting Inclusions

- Kilchis and Harslow soils in convex, more steeply sloping positions
- Klistan and Hemcross soils that are stony and are below areas of Rock outcrop
- Klistan and Hemcross soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Klistan and Hemcross

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition

Klistan

- High amount of rock fragments in the soil

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Klistan soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

128F—Laderly very gravelly loam, 30 to 60 percent north slopes

Composition

Laderly soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from basalt
Elevation: 1,500 to 2,850 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and western swordfern
Climatic factors:
Mean annual precipitation—90 to 120 inches
Mean annual air temperature—42 to 45 degrees F
Frost-free period—100 to 145 days

Typical Profile

0 to 4 inches—very dark brown very gravelly loam
4 to 13 inches—dark brown very gravelly loam
13 to 32 inches—dark yellowish brown extremely cobbly loam
32 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained

Permeability: Moderate
Available water capacity: About 3.5 inches

Contrasting Inclusions

- Romanose soils in convex, more steeply sloping positions
- Soils that are similar to this Laderly soil but have bedrock at a depth of more than 40 inches and are in concave, less sloping positions
- Soils that are similar to this Laderly soil but have less than 35 percent rock fragments
- Laderly soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Plant competition
- Seedling mortality
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

129G—Laderly-Romanose complex, 60 to 90 percent north slopes

Composition

Laderly soil and similar inclusions—45 percent
Romanose soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from basalt
Elevation: 1,500 to 2,850 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and western swordfern
Climatic factors:
Mean annual precipitation—90 to 120 inches
Mean annual air temperature—42 to 45 degrees F
Frost-free period—100 to 145 days

Laderly Soil

Typical profile

0 to 4 inches—very dark brown very gravelly loam
4 to 13 inches—dark brown very gravelly loam
13 to 32 inches—dark yellowish brown extremely cobbly loam
32 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 3.5 inches

Romanose Soil

Typical profile

0 to 12 inches—very dark brown and dark brown very gravelly sandy loam
12 to 18 inches—dark yellowish brown extremely cobbly sandy loam
18 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 2 inches

Contrasting Inclusions

- Rock outcrop in convex, more steeply sloping positions
- Soils that are similar to the Laderly soil but have

bedrock at a depth of more than 40 inches and are in concave, less sloping positions
• Soils that are similar to the Laderly soil but have less than 35 percent rock fragments
• Laderly and Romanose soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Laderly and Romanose

• Steepness of slope
• Hazard of erosion
• High amount of rock fragments on the surface and in the soil
• Hazard of slope failure
• Plant competition
• Seedling mortality
• Depth to rock

Romanose

• Hazard of windthrow

Use and Management

Woodland

• Highlead or other cable logging systems are best suited to this unit.
• When the soils are dry, landings can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Headwall areas should be avoided when constructing roads.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees on the Romanose soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

130E—Lempira gravelly loam, 3 to 30 percent slopes

Composition

Lempira soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Ridges
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 3,000 to 4,500 feet
Native plants: Douglas fir and western hemlock with an understory of salal, vine maple, Pacific rhododendron, and cascade Oregongrape
Climatic factors:
Mean annual precipitation—60 to 80 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Typical Profile

0 to 14 inches—very dark grayish brown and dark brown gravelly loam
14 to 29 inches—dark brown gravelly loam
29 to 60 inches—dark yellowish brown gravelly loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 13.5 inches

Contrasting Inclusions

• Illahee and Scaredman soils in convex, more steeply sloping positions
• Soils that are similar to this Lempira soil but are poorly drained and are in concave positions and near drainageways
• Lempira soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

• Hazard of erosion
• Plant competition
• Steepness of slope

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Air drainage may be restricted on this unit; therefore, timber harvesting methods should be designed to reduce the effect of frost on regeneration.

131F—Lempira-Illahee complex, 30 to 60 percent north slopes

Composition

Lempira soil and similar inclusions—55 percent
Illahee soil and similar inclusions—35 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Lempira—concave side slopes; Illahee—convex side slopes
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 2,800 to 4,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, vine maple, Pacific rhododendron, and cascade Oregongrape
Climatic factors:
Mean annual precipitation—60 to 80 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Lempira Soil

Typical profile

0 to 14 inches—very dark grayish brown and dark brown gravelly loam
14 to 29 inches—dark brown gravelly loam
29 to 60 inches—dark yellowish brown gravelly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 13.5 inches

Illahee Soil

Typical profile

0 to 10 inches—black very gravelly loam
10 to 47 inches—very dark brown to dark brown very gravelly loam
47 to 60 inches—dark yellowish brown very cobbly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 6 inches

Contrasting Inclusions

• Rock outcrop and Limpy and Scaredman soils in convex, more steeply sloping positions
• Lempira and Illahee soils that have slopes of less than 30 percent
• Illahee soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Lempira and Illahee

• Steepness of slope
• Hazard of erosion
• Plant competition

Illahee

• High amount of rock fragments on the surface and in the soil
• Seedling mortality

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads,

roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on the Illahee soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

132E—Leopold clay loam, 3 to 30 percent slopes

Composition

Leopold soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Plateaus
Landscape position: Broad ridges
Parent material: Colluvium and residuum derived from sandstone
Elevation: 1,750 to 2,550 feet
Native plants: Douglas fir and western hemlock with an understory of Pacific rhododendron, salal, cascade Oregongrape, and western swordfern
Climatic factors:
Mean annual precipitation—90 to 120 inches
Mean annual air temperature—42 to 45 degrees F
Frost-free period—100 to 145 days

Typical Profile

0 to 5 inches—dark brown clay loam
5 to 20 inches—brown gravelly silty clay loam
20 to 24 inches—brown very gravelly silty clay loam
24 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 4.5 inches

Contrasting Inclusions

• Rock outcrop in convex, more steeply sloping positions
• Soils that are similar to this Leopold soil but have more than 35 percent rock fragments and are in convex, more steeply sloping positions
• Leopold soils that have a very gravelly surface layer
• Soils that are similar to this Leopold soil but have bedrock at a depth of more than 40 inches and are in concave positions
• Leopold soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

• Hazards of compaction and erosion
• Plant competition
• Seedling mortality
• Steepness of slope
• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

132F—Leopold clay loam, 30 to 60 percent slopes

Composition

Leopold soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Plateaus
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from sandstone
Elevation: 1,750 to 2,550 feet
Native plants: Douglas fir and western hemlock with an understory of Pacific rhododendron, salal, cascade Oregongrape, and western swordfern
Climatic factors:
Mean annual precipitation—90 to 120 inches
Mean annual air temperature—42 to 45 degrees F
Frost-free period—100 to 145 days

Typical Profile

0 to 5 inches—dark brown clay loam
5 to 20 inches—brown gravelly silty clay loam
20 to 24 inches—brown very gravelly silty clay loam
24 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 4.5 inches

Contrasting Inclusions

- Rock outcrop in convex, more steeply sloping areas
- Soils that are similar to this Leopold soil but have more than 35 percent rock fragments and are in convex, more steeply sloping positions
- Leopold soils that have a very gravelly surface layer
- Soils that are similar to this Leopold soil but have bedrock at a depth of more than 40 inches and are in concave, less sloping positions
- Leopold soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Seedling mortality
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

133E—Lettia gravelly loam, 3 to 30 percent slopes

Composition

Lettia soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Footslopes and ridges
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 1,000 to 4,000 feet
Native plants: Douglas fir with an understory of salal, golden chinkapin, cascade Oregongrape, and deerfoot vanillaleaf
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Typical Profile

0 to 12 inches—dark brown gravelly loam
12 to 16 inches—strong brown loam
16 to 58 inches—strong brown clay loam
58 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Contrasting Inclusions

- Acker, Dumont, and Norling soils underlain by metamorphic rock
- Steinmetz soils in more steeply sloping positions
- Sitkum soils in convex, more steeply sloping positions
- Zing soils in concave positions and near drainageways
- Lettia soils that have slopes of more than 30 percent

Major Uses

Woodland, hay and pasture, and homesite development

Major Management Limitations

- Hazards of erosion and compaction
- Plant competition
- Seedling mortality
- Steepness of slope
- Moderately slow permeability
- Hazard of fire damage

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

134F—Lettia gravelly loam, 30 to 60 percent north slopes

Composition

Lettia soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes

Parent material: Residuum and colluvium derived from granodiorite
Elevation: 1,000 to 4,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, whipplevine, cascade Oregongrape, and deerfoot vanillaleaf
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Typical Profile

0 to 12 inches—dark brown gravelly loam
12 to 16 inches—strong brown loam
16 to 58 inches—strong brown clay loam
58 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Contrasting Inclusions

- Acker, Dumont, and Norling soils underlain by metamorphic rock
- Steinmetz soils in more steeply sloping positions
- Sitkum soils in convex, more steeply sloping positions
- Zing soils in concave, less sloping positions
- Lettia soils that have slopes of less than 30 percent

Major Use

Woodland

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Plant competition
- Seedling mortality
- Moderately slow permeability
- Hazard of fire damage

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer (fig. 10).
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.

135F—Lettia gravelly loam, 30 to 60 percent south slopes

Composition

Lettia soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 1,000 to 4,000 feet
Native plants: Douglas fir and sugar pine with an understory of tall Oregongrape, creambush oceanspray, whipplevine, and western fescue
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Typical Profile

0 to 12 inches—dark brown gravelly loam
12 to 16 inches—strong brown loam
16 to 58 inches—strong brown clay loam
58 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

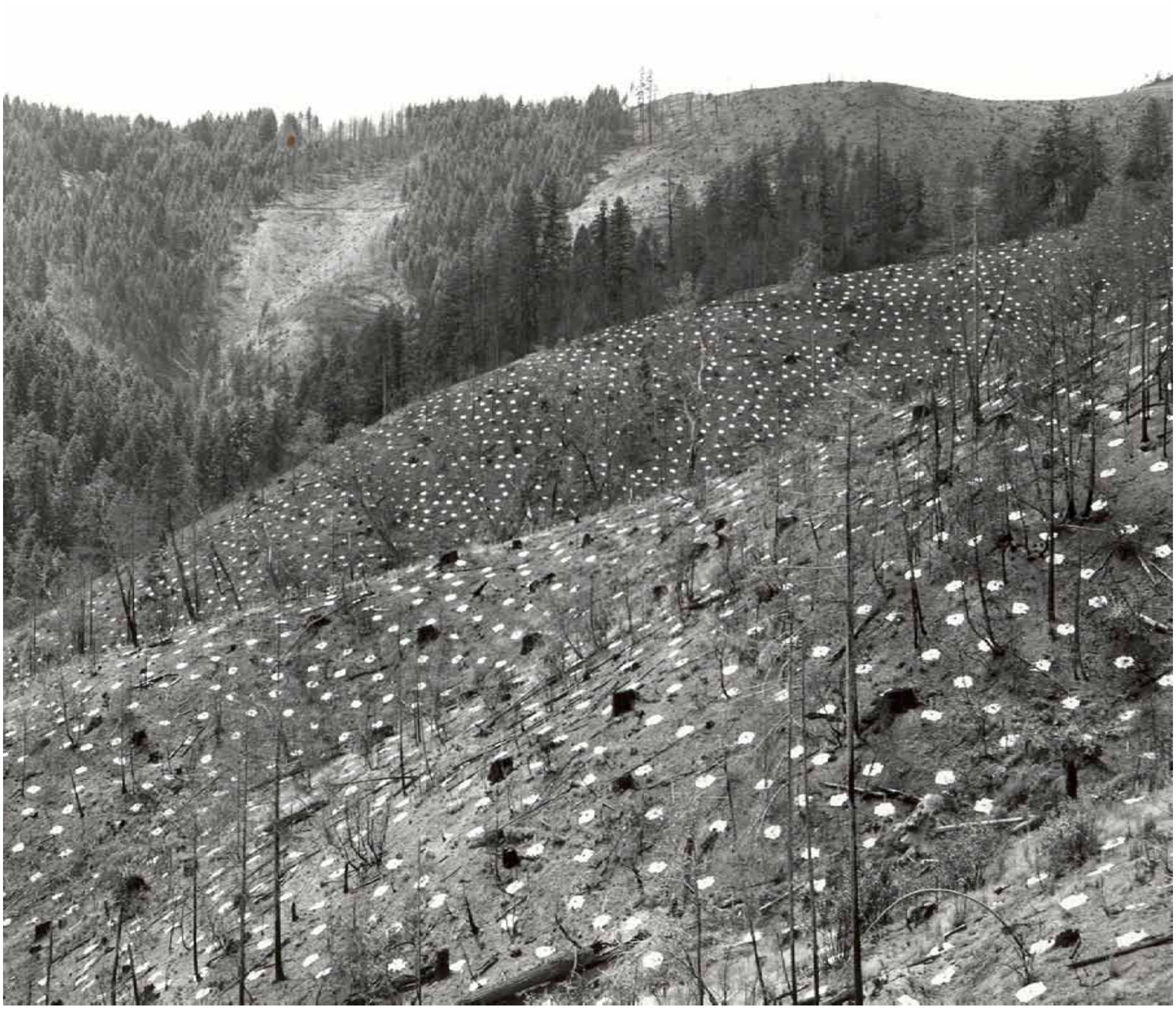


Figure 10.—Paper mulch in an area of Lettia gravelly loam, 30 to 60 percent north slopes.

Contrasting Inclusions

- Acker, Dumont, and Norling soils underlain by metamorphic rock
- Steinmetz soils in more steeply sloping positions
- Sitkum soils in convex, more steeply sloping positions
- Zing soils in concave, less sloping positions
- Lettia soils that have slopes of less than 30 percent

Major Use

Woodland

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Seedling mortality
- Plant competition
- Hazard of fire damage
- Moderately slow permeability

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads,

roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.

136E—Lettia-Beal-Zing complex, 3 to 30 percent slopes

Composition

Lettia soil and similar inclusions—35 percent
Beal soil and similar inclusions—30 percent
Zing soil and similar inclusions—25 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Lettia—footslopes and convex side slopes; Beal—footslopes and concave side slopes; Zing—footslopes and concave side slopes
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 1,100 to 2,800 feet
Native plants: Douglas fir and Pacific madrone with an understory of salal, cascade Oregongrape, western swordfern, and creambush oceanspray
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Lettia Soil

Typical profile

0 to 12 inches—dark brown gravelly loam
12 to 16 inches—strong brown loam
16 to 58 inches—strong brown clay loam
58 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Beal Soil

Typical profile

0 to 10 inches—very dark grayish brown and dark brown loam
10 to 18 inches—dark yellowish brown loam
18 to 39 inches—dark yellowish brown clay loam
39 to 60 inches—olive clay loam and clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 24 to 36 inches in November through May
Permeability: Moderately slow
Available water capacity: About 10 inches

Zing Soil

Typical profile

0 to 7 inches—dark brown loam
7 to 10 inches—dark brown clay loam
10 to 17 inches—dark yellowish brown clay
17 to 45 inches—gray clay
45 to 62 inches—light olive gray clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 24 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Acker, Dumont, and Norling soils underlain by metamorphic rock
- Sharpshooter and Threeforks soils underlain by mica schist
- Dompier soils in concave positions
- Steinmetz soils in more steeply sloping positions
- Sitkum soils in convex, more steeply sloping positions
- Lettia, Beal, and Zing soils that have slopes of more than 30 percent

Major Uses

Woodland, and hay and pasture

Major Management Limitations

Lettia, Beal, and Zing

- Hazards of erosion and compaction
- Hazard of slope failure
- Plant competition
- Steepness of slope
- Hazard of fire damage

Lettia

- Seedling mortality
- Moderately slow permeability

Beal

- Wetness
- Moderately slow permeability
- Hazard of windthrow

Zing

- Wetness
- High shrink-swell potential
- Slow permeability
- Low soil strength
- Hazard of windthrow

Use and Management

Woodland

- Because the Beal and Zing soils are unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Avoiding very wet areas, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Increased erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees on the Beal and Zing soils commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soils and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- In the areas of the Zing soil, select plants that can tolerate wetness.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

137F—Lettia-Beal-Zing complex, 30 to 60 percent north slopes

Composition

Lettia soil and similar inclusions—40 percent
Beal soil and similar inclusions—30 percent
Zing soil and similar inclusions—15 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Lettia—convex side slopes; Beal—concave side slopes; Zing—concave side slopes of less than 45 percent
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 1,100 to 2,800 feet
Native plants: Douglas fir and Pacific madrone with an

understory of salal, cascade Oregongrape, western swordfern, and creambush oceanspray

Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Lettia Soil

Typical profile

0 to 12 inches—dark brown gravelly loam
12 to 16 inches—strong brown loam
16 to 58 inches—strong brown clay loam
58 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Beal Soil

Typical profile

0 to 10 inches—very dark grayish brown and dark brown loam
10 to 18 inches—dark yellowish brown loam
18 to 39 inches—dark yellowish brown clay loam
39 to 60 inches—olive clay loam and clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 24 to 36 inches in November through May
Permeability: Moderately slow
Available water capacity: About 10 inches

Zing Soil

Typical profile

0 to 7 inches—dark brown loam
7 to 10 inches—dark brown clay loam
10 to 17 inches—dark yellowish brown clay
17 to 45 inches—gray clay
45 to 62 inches—light olive gray clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 24 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Acker, Dumont, and Norling soils underlain by metamorphic rock
- Sharpshooter and Threeforks soils underlain by mica schist
- Dompier soils in concave positions
- Steinmetz soils in more steeply sloping positions
- Sitkum soils in convex, more steeply sloping positions
- Lettia, Beal, and Zing soils that have slopes of less than 30 percent

Major Use

Woodland

Major Management Limitations

Lettia, Beal, and Zing

- Steepness of slope
- Hazards of erosion and compaction
- Hazard of slope failure
- Plant competition
- Hazard of fire damage

Lettia

- Seedling mortality
- Moderately slow permeability

Beal

- Wetness
- Moderately slow permeability
- Hazard of windthrow

Zing

- Wetness
- High shrink-swell potential
- Slow permeability
- Low soil strength
- Hazard of windthrow

Use and Management

Woodland

- Because the Beal and Zing soils are unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and

care in the placement of culverts help to control erosion.

- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Avoiding very wet areas, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees on the Beal and Zing soils commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

138F—Lettia-Beal-Zing complex, 30 to 60 percent south slopes

Composition

Lettia soil and similar inclusions—40 percent
Beal soil and similar inclusions—30 percent
Zing soil and similar inclusions—15 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Lettia—convex side slopes; Beal—concave side slopes; Zing—concave side slopes of less than 45 percent
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 1,100 to 2,800 feet
Native plants: Douglas fir and ponderosa pine with an understory of Pacific poison oak, tall Oregongrape, whipplevine, and mountain brome
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Lettia Soil

Typical profile

0 to 12 inches—dark brown gravelly loam
12 to 16 inches—strong brown loam
16 to 58 inches—strong brown clay loam
58 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Beal Soil

Typical profile

0 to 10 inches—very dark grayish brown and dark brown loam
10 to 18 inches—dark yellowish brown loam
18 to 39 inches—dark yellowish brown clay loam
39 to 60 inches—olive clay loam and clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 24 to 36 inches in November through May
Permeability: Moderately slow
Available water capacity: About 10 inches

Zing Soil

Typical profile

0 to 7 inches—dark brown loam
7 to 10 inches—dark brown clay loam
10 to 17 inches—dark yellowish brown clay
17 to 45 inches—gray clay
45 to 62 inches—light olive gray clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 24 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Acker, Dumont, and Norling soils underlain by metamorphic rock
- Sharpshooter and Threeforks soils underlain by mica schist

- Dompier soils in convex positions
- Steinmetz soils in more steeply sloping positions
- Sitkum soils in convex, more steeply sloping positions
- Lettia, Beal, and Zing soils that have slopes of less than 30 percent

Major Use

Woodland

Major Management Limitations

Lettia, Beal, and Zing

- Hazards of erosion and compaction
- Steepness of slope
- Hazard of slope failure
- Plant competition
- Hazard of fire damage

Lettia

- Seedling mortality
- Moderately slow permeability

Beal

- Wetness
- Seedling mortality
- Moderately slow permeability
- Hazard of windthrow

Zing

- Wetness
- High shrink-swell potential
- Slow permeability
- Low soil strength
- Hazard of windthrow

Use and Management

Woodland

- Because the Beal and Zing soils are unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Avoiding very wet areas, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees on the Beal and Zing soils commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

139F—Lettia-Tishar complex, 30 to 70 percent north slopes

Composition

Lettia soil and similar inclusions—55 percent
Tishar soil and similar inclusions—25 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Lettia—colluvium and residuum derived from granodiorite; Tishar—colluvium and residuum derived from volcanic rock
Elevation: 1,350 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, cascade Oregongrape, western swordfern, and common snowberry
Climatic factors:
Mean annual precipitation—35 to 60 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 200 days

Lettia Soil

Typical profile

0 to 12 inches—dark brown gravelly loam
12 to 16 inches—strong brown loam
16 to 58 inches—strong brown clay loam
58 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Tishar Soil

Typical profile

0 to 13 inches—dark brown gravelly silty clay loam
13 to 22 inches—yellowish red very gravelly silty clay
22 to 52 inches—yellowish red very gravelly clay
52 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Contrasting Inclusions

- Acker, Dumont, and Norling soils underlain by metamorphic rock
- Steinmetz soils in more steeply sloping positions
- McGinnis and Sitkum soils in convex, more steeply sloping positions
- Zing soils in concave, less sloping positions
- Lettia and Tishar soils that have slopes of less than 30 percent
- Tishar soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Lettia and Tishar

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Seedling mortality
- Moderately slow permeability

Lettia

- Hazard of fire damage

Tishar

- High amount of rock fragments in the soil

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Tishar soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- In areas of the Lettia soil, increased erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.

140F—Lettia-Tishar complex, 30 to 70 percent south slopes

Composition

Lettia soil and similar inclusions—55 percent
Tishar soil and similar inclusions—25 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Lettia—colluvium and residuum

derived from granodiorite; Tishar—colluvium and residuum derived from volcanic rock
Elevation: 1,650 to 2,600 feet
Native plants: Douglas fir and sugar pine with an understory of tall Oregongrape, creambush oceanspray, whipplevine, and western fescue
Climatic factors:
Mean annual precipitation—35 to 60 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 200 days

Lettia Soil

Typical profile

0 to 12 inches—dark brown gravelly loam
12 to 16 inches—strong brown loam
16 to 58 inches—strong brown clay loam
58 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Tishar Soil

Typical profile

0 to 13 inches—dark brown gravelly silty clay loam
13 to 22 inches—yellowish red very gravelly silty clay
22 to 52 inches—yellowish red very gravelly clay
52 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Contrasting Inclusions

- Acker, Dumont, and Norling soils underlain by metamorphic rock
- Steinmetz soils in more steeply sloping positions
- McGinnis and Sitkum soils in convex, more steeply sloping positions
- Zing soils in concave, less sloping positions
- Lettia and Tishar soils that have slopes of less than 30 percent
- Tishar soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Lettia and Tishar

- Steepness of slope
- Hazards of erosion and compaction
- Seedling mortality
- Plant competition
- Moderately slow permeability

Lettia

- Hazard of fire damage

Tishar

- High amount of rock fragments in the soil

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Tishar soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- In areas of the Lettia soil, increased erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.

141C—Lint silt loam, 0 to 12 percent slopes

Composition

Lint soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Marine terraces
Landscape position: High marine terraces
Parent material: Mixed alluvium
Elevation: 20 to 300 feet
Native plants: Douglas fir and western hemlock with an understory of Pacific rhododendron, salal, vine maple, and salmonberry
Climatic factors:
Mean annual precipitation—70 to 90 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—180 to 240 days

Typical Profile

0 to 10 inches—very dark brown silt loam
10 to 19 inches—dark brown silt loam
19 to 39 inches—dark brown silty clay loam
39 to 62 inches—dark yellowish brown silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 21 inches

Contrasting Inclusions

- Coquille soils on flood plains
- Salander, Svensen, and Templeton soils in more steeply sloping areas
- Lint soils that have slopes of more than 12 percent

Major Uses

Woodland, hay and pasture, and homesite development

Major Management Limitations

- Hazards of compaction and erosion
- Plant competition
- Low soil strength

Use and Management

Woodland

- Use conventional equipment in harvesting, but limit its use when the soil is wet.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

Hay and pasture

- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Roads should be designed to offset the limited ability of the soil to support a load.

141D—Lint silt loam, 12 to 20 percent slopes

Composition

Lint soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Marine terraces
Landscape position: High marine terraces
Parent material: Mixed alluvium
Elevation: 20 to 300 feet
Native plants: Douglas fir and western hemlock with

an understory of Pacific rhododendron, salal, vine maple, and salmonberry
Climatic factors:
Mean annual precipitation—70 to 90 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—180 to 240 days

Typical Profile

0 to 10 inches—very dark brown silt loam
10 to 19 inches—dark brown silt loam
19 to 39 inches—dark brown silty clay loam
39 to 62 inches—dark yellowish brown silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 21 inches

Contrasting Inclusions

- Coquille soils on flood plains
- Salander, Svensen, and Templeton soils in more steeply sloping areas
- Lint soils that have slopes of less than 12 percent

Major Uses

Woodland, hay and pasture, and homesite development

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Plant competition
- Low soil strength

Use and Management

Woodland

- Use conventional equipment in harvesting, but limit its use when the soil is wet.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

Hay and pasture

- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Roads should be designed to offset the limited ability of the soil to support a load.
- Seed cuts and fills to permanent vegetation.

142G—Littlesand-Nonpareil-Rock outcrop complex, 60 to 90 percent south slopes

Composition

Littlesand soil and similar inclusions—35 percent
Nonpareil soil and similar inclusions—30 percent
Rock outcrop—10 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Littlesand—side slopes; Nonpareil and Rock outcrop—side slopes and headwalls
Parent material: Colluvium derived from sandstone
Elevation: 400 to 1,600 feet
Native plants: Littlesand—Douglas fir and grand fir with an understory of salal, cascade Oregongrape, red huckleberry, and western swordfern; Nonpareil—Oregon white oak and Pacific madrone with an understory of Pacific poison oak, hairy honeysuckle, Saskatoon serviceberry, and blue wildrye

Climatic factors:
Mean annual precipitation—45 to 50 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—160 to 225 days

Littlesand Soil

Typical profile

0 to 8 inches—very dark grayish brown gravelly loam
8 to 18 inches—dark yellowish brown gravelly clay loam
18 to 39 inches—yellowish brown cobbly clay loam
39 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4 inches

Nonpareil Soil

Typical profile

0 to 4 inches—brown loam
4 to 17 inches—brown and dark yellowish brown loam
17 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2.5 inches

Rock outcrop

Description: Areas of exposed bedrock

Contrasting Inclusions

- Atring, Dickerson, and Larmine soils in convex, more steeply sloping positions
- Kanid and Rosehaven soils in concave, less sloping positions
- Littlesand and Nonpareil soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Map unit

- Areas of Rock outcrop

Littlesand and Nonpareil

- Steepness of slope
- Hazards of erosion and compaction
- Hazard of windthrow
- Depth to rock

Littlesand

- Hazard of slope failure
- Plant competition

Nonpareil

- Droughtiness
- Low soil strength

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- Avoiding areas with a high amount of Rock outcrop will minimize breakage of timber and increase the efficiency of yarding operations.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

143G—Littlesand-Rosehaven-Atring complex, 60 to 90 percent slopes

Composition

Littlesand soil and similar inclusions—35 percent
Rosehaven soil and similar inclusions—25 percent
Atring soil and similar inclusions—20 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Littlesand and Atring—convex side slopes; Rosehaven—concave side slopes
Parent material: Colluvium derived from sandstone
Elevation: 400 to 1,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, cascade Oregongrape, red huckleberry, and western swordfern
Climatic factors:
Mean annual precipitation—45 to 50 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—160 to 225 days

Littlesand Soil

Typical profile

0 to 8 inches—very dark grayish brown gravelly loam
8 to 18 inches—dark yellowish brown gravelly clay loam
18 to 39 inches—yellowish brown cobbly clay loam
39 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4 inches

Rosehaven Soil

Typical profile

0 to 12 inches—dark brown loam
12 to 25 inches—dark yellowish brown clay loam
25 to 63 inches—yellowish brown clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 11 inches

Atring Soil

Typical profile

0 to 9 inches—dark grayish brown gravelly loam
9 to 20 inches—brown very gravelly loam
20 to 35 inches—yellowish brown very gravelly loam
35 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

- Kanid soils in concave positions
- Bateman soils in concave, less sloping positions
- Larmine soils in convex, more steeply sloping positions
- Rosehaven soils that have slopes less than 60 percent
- Littlesand and Atring soils that have slopes of more than 90 percent

Major Use

Woodland

Major Management Limitations

Littlesand, Rosehaven, and Atring

- Steepness of slope
- Hazards of erosion and compaction
- Hazard of slope failure
- Plant competition

Littlesand

- Hazard of windthrow
- Depth to rock

Atring

- High amount of rock fragments in the soil
- Seedling mortality
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Highlead or other cable logging systems are the most suitable.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
- Roadcuts on the Atring soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore,

onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Littlesand and Atring soils commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

144A—Malabon silty clay loam, 0 to 3 percent slopes

Composition

Malabon soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Terraces
Landscape position: Low terraces
Parent material: Mixed alluvium
Elevation: 100 to 1,300 feet
Native plants: Bigleaf maple and Oregon white oak with an understory of western hazel, common snowberry, Pacific poison oak, and mountain brome
Climatic factors:
Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 13 inches—very dark grayish brown silty clay loam
13 to 20 inches—very dark grayish brown silty clay loam
20 to 43 inches—very dark grayish brown silty clay
43 to 63 inches—dark brown silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 11 inches

Contrasting Inclusions

- Foehlin soils
- Malabon soils on flood plains
- Packard soils in convex positions
- Conser and Redbell soils in concave positions

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

- Hazard of compaction
- Moderately slow permeability
- Low soil strength

Use and Management

Cropland

- Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Leveling is needed in sloping areas.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Roads should be designed to offset the limited ability of the soil to support a load.

145A—Malabon silty clay loam, flooded, 0 to 3 percent slopes

Composition

Malabon soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Flood plains
Landscape position: High flood plains
Parent material: Mixed alluvium
Elevation: 400 to 1,300 feet
Native plants: Bigleaf maple and Oregon white oak with an understory of western hazel, common snowberry, Pacific poison oak, and mountain brome
Climatic factors:
Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 13 inches—very dark grayish brown silty clay loam
13 to 20 inches—very dark grayish brown silty clay loam
20 to 43 inches—very dark grayish brown silty clay
43 to 63 inches—dark brown silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 11 inches
Frequency of flooding: Occasional in December through March

Contrasting Inclusions

- Chapman and Chehalis soils
- Malabon soils on terraces
- Packard soils in convex positions
- Waldo soils in concave positions

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

- Hazard of flooding
- Hazard of compaction
- Moderately slow permeability
- Low soil strength

Use and Management

Cropland

- Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Leveling is needed in sloping areas.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Reduce the risk of erosion by providing structures along streambanks to control the flow of water and by planting cover crops.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Roads should be designed to offset the limited ability of the soil to support a load.
- Structures and roads should be located above the expected flood level.

146E—McComas very gravelly loam, 3 to 30 percent slopes

Composition

McComas soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills

Landscape position: Slump blocks
Parent material: Colluvium derived from basalt
Elevation: 900 to 2,200 feet
Native plants: Oregon white oak with an understory of Pacific poison oak, hairy honeysuckle, rose, blue wildrye, and sedge
Climatic factors:
Mean annual precipitation—40 to 50 inches
Mean annual air temperature—50 to 54 degrees F
Frost-free period—160 to 200 days

Typical Profile

0 to 5 inches—dark brown very gravelly loam
5 to 13 inches—dark brown very cobbly silty clay loam
13 to 27 inches—dark grayish brown very cobbly clay
27 to 38 inches—dark grayish brown very cobbly clay
38 to 63 inches—dark grayish brown extremely stony clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 6 to 18 inches in November through May
Permeability: Moderately slow above the clay layer and very slow through it
Available water capacity: About 4 inches
Shrink-swell potential: High

Contrasting Inclusions

- Soils that are similar to this McComas soil but are poorly drained and are in concave positions
- McComas soils that are stony
- Yoncalla soils

Major Use

Pasture

Major Management Limitations

- Wetness
- High amount of rock fragments on the surface and in the soil
- Hazards of compaction and erosion
- Steepness of slope
- Depth to the clay layer
- High shrink swell potential and very slow permeability of the clay layer
- Hazard of slope failure
- Low soil strength

Use and Management

Pasture

- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate wetness.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

147F—McDuff-Absaquil-Blachly complex, 30 to 60 percent slopes

Composition

McDuff soil and similar inclusions—35 percent
Absaquil soil and similar inclusions—25 percent
Blachly soil and similar inclusions—20 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: McDuff—convex side slopes and ridges; Absaquil—side slopes and ridges; Blachly—concave side slopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—60 to 90 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

McDuff Soil

Typical profile

0 to 10 inches—dark brown silty clay loam
10 to 32 inches—strong brown and dark yellowish brown clay
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained

Permeability: Moderately slow
Available water capacity: About 4 inches

Absaquil Soil

Typical profile

0 to 10 inches—dark brown and dark yellowish brown silt loam
10 to 26 inches—brown and strong brown silty clay loam
26 to 32 inches—strong brown silty clay
32 to 45 inches—strong brown gravelly silty clay
45 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Blachly Soil

Typical profile

0 to 10 inches—dark reddish brown silty clay loam
10 to 21 inches—dark red clay
21 to 60 inches—red clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 7.5 inches

Contrasting Inclusions

- Preacher soils
- Bohannon and Damewood soils in convex, more steeply sloping positions
- McDuff, Absaquil, and Blachly soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

McDuff, Absaquil, and Blachly

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Low soil strength

McDuff

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the McDuff soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

148F—McDuff-Absaquil-Honeygrove complex, 30 to 60 percent slopes

Composition

McDuff soil and similar inclusions—35 percent
Absaquil soil and similar inclusions—25 percent
Honeygrove soil and similar inclusions—20 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: McDuff—convex side slopes and ridges; Absaquil—side slopes and ridges; Honeygrove—concave side slopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 80 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

McDuff Soil

Typical profile

0 to 10 inches—dark brown silty clay loam
10 to 32 inches—strong brown and dark yellowish brown clay
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4 inches

Absaquil Soil

Typical profile

0 to 10 inches—dark brown and dark yellowish brown silt loam
10 to 26 inches—brown and strong brown silty clay loam
26 to 32 inches—strong brown silty clay
32 to 45 inches—strong brown gravelly silty clay
45 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Honeygrove Soil

Typical profile

0 to 12 inches—dark reddish brown gravelly clay loam
12 to 30 inches—dark reddish brown clay
30 to 63 inches—dark red clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Contrasting Inclusions

- Preacher soils
- Bohannon and Digger soils in convex, more steeply sloping positions
- McDuff, Absaquil, and Honeygrove soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

McDuff, Absaquil, and Honeygrove

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Low soil strength

McDuff

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the McDuff soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

149E—McMullin-Reston complex, 3 to 30 percent slopes

Composition

McMullin soil and similar inclusions—40 percent
Reston soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills and mountains
Landscape position: Ridges
Parent material: Colluvium and residuum derived from metamorphic rock
Elevation: 600 to 3,200 feet

Native plants: McMullin—Oregon white oak with an understory of Pacific poison oak, wedgeleaf ceanothus, western yarrow, blue wildrye, and pine bluegrass; Reston—Pacific poison oak, wedgeleaf ceanothus, filaree, wooly eriophyllum, western yarrow, and pine bluegrass
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

McMullin Soil

Typical profile

0 to 4 inches—dark brown loam
4 to 19 inches—dark brown and dark yellowish brown gravelly loam
19 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 12 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2 inches

Reston Soil

Typical profile

0 to 2 inches—very dark grayish brown loam
2 to 7 inches—dark brown loam
7 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 5 to 10 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 1 inch

Contrasting Inclusions

- Buckeye and Speaker soils
- Josephine, Pengra, and Sutherlin soils in concave positions
- Rock outcrop in convex, more steeply sloping positions
- McMullin and Reston soils that have slopes of more than 30 percent

Major Use

Livestock grazing

Major Management Limitations

- Depth to rock
- Hazards of compaction and erosion
- Steepness of slope
- Droughtiness

Use and Management

Livestock grazing

- Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
- Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
- Brush management and seeding reduce competition from woody plants and improve degraded areas.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

149F—McMullin-Reston complex, 30 to 75 percent slopes

Composition

McMullin soil and similar inclusions—40 percent
Reston soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills and mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from metamorphic rock
Elevation: 600 to 3,200 feet
Native plants: McMullin—Oregon white oak with an understory of Pacific poison oak, wedgeleaf ceanothus, western yarrow, blue wildrye, and pine bluegrass; Reston—Pacific poison oak, wedgeleaf ceanothus, filaree, wooly eriophyllum, western yarrow, and pine bluegrass
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

McMullin Soil

Typical profile

0 to 4 inches—dark brown loam
4 to 19 inches—dark brown and dark yellowish brown gravelly loam
19 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 12 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2 inches

Reston Soil

Typical profile

0 to 2 inches—very dark grayish brown loam
2 to 7 inches—dark brown loam
7 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 5 to 10 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 1 inch

Contrasting Inclusions

- Buckeye and Speaker soils
- Josephine, Pengra and Sutherlin soils in concave, less sloping positions
- Rock outcrop in convex, more steeply sloping positions
- McMullin and Reston soils that have slopes of less than 30 percent or more than 75 percent

Major Uses

Livestock grazing

Major Management Limitations

- Depth to rock
- Steepness of slope
- Hazards of erosion and compaction
- Droughtiness

Use and Management

Livestock grazing

- Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
- Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
- Brush management and seeding reduce competition from woody plants and improve degraded areas.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.
- Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

150F—McMullin-Reston-Rock outcrop complex, 30 to 75 percent slopes

Composition

McMullin soil and similar inclusions—30 percent
Reston soil and similar inclusions—30 percent
Rock outcrop—20 percent
Contrasting inclusions—20 percent

Setting

Landform: Hills and mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from metamorphic rock
Elevation: 600 to 3,200 feet
Native plants: McMullin—Oregon white oak with an understory of Pacific poison oak, wedgeleaf ceanothus, western yarrow, blue wildrye, and pine bluegrass; Reston—Pacific poison oak, wedgeleaf ceanothus, filaree, wooly eriophyllum, western yarrow, and pine bluegrass
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

McMullin Soil

Typical profile

0 to 4 inches—dark brown loam
4 to 19 inches—dark brown and dark yellowish brown gravelly loam
19 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 12 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2 inches

Reston Soil

Typical profile

0 to 2 inches—very dark grayish brown loam
2 to 7 inches—dark brown loam
7 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 5 to 10 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 1 inch

Rock Outcrop

Description: Areas of exposed bedrock

Contrasting Inclusions

- Josephine, Buckeye, and Speaker soils
- Pengra and Sutherlin soils in concave and less sloping positions
- McMullin and Reston soils that have a very cobbly

or very stony surface layer and are below areas of Rock outcrop
• McMullin and Reston soils that have slopes of less than 30 percent or more than 75 percent

Major Uses

Livestock grazing

Major Management Limitations

• Areas of Rock outcrop
• Steepness of slope
• Depth to rock
• Hazards of erosion and compaction
• Droughtiness

Use and Management

Livestock grazing

• Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
• Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
• Brush management and seeding reduce competition from woody plants and improve degraded areas.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.
• Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

151A—McNab clay loam, 0 to 3 percent slopes

Composition

McNab soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Swales
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 1,000 to 2,500 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, western swordfern, and hairy honeysuckle
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—120 to 200 days

Typical Profile

0 to 6 inches—dark brown clay loam
6 to 17 inches—brown clay
17 to 42 inches—yellowish brown clay
42 to 60 inches—light olive brown silty clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 18 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

• Windygap soils that are dry and are in convex, more steeply sloping positions
• Soils that are similar to this McNab soil but are poorly drained
• Waldo soils on narrow flood plains
• McNab soils that have slopes of more than 3 percent

Major Use

Woodland

Major Management Limitations

• Wetness
• Hazard of compaction
• Plant competition
• Slow permeability
• Low soil strength
• Hazard of windthrow

Use and Management

Woodland

• Because this soil is not suited to traffic when wet, use conventional equipment in harvesting but limit its use to periods when the soil is dry.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, skid trails, and landings.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial

reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

152E—McNab-Windygap complex, 3 to 30 percent slopes

Composition

McNab soil and similar inclusions—55 percent
Windygap soil and similar inclusions—30 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: McNab—swales with slopes of less than 20 percent; Windygap—footslopes and convex side slopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 1,000 to 2,500 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, western swordfern, and hairy honeysuckle
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—120 to 200 days

McNab Soil

Typical profile

0 to 6 inches—dark brown clay loam
6 to 17 inches—dark yellowish brown clay
17 to 42 inches—yellowish brown clay
42 to 60 inches—light olive brown silty clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 18 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Windygap Soil

Typical profile

0 to 4 inches—dark brown clay loam
4 to 7 inches—reddish brown clay loam
7 to 16 inches—yellowish red clay
16 to 58 inches—red silty clay
58 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8.5 inches

Contrasting Inclusions

- Acker soils that are in convex positions and formed in coarse sandstone
- Soils that are similar to the McNab soil but are poorly drained
- Soils that are similar to the McNab soil but have 25 to 35 percent rock fragments
- Bellpine soils in convex, more steeply sloping positions
- Windygap soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

McNab and Windygap

- Hazards of compaction and erosion
- Hazard of slope failure
- Plant competition

McNab

- Wetness
- Hazard of windthrow
- Slow permeability
- Low soil strength

Windygap

- Moderately slow permeability

Use and Management

Woodland

- Because the McNab soil is unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and

harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees on the McNab soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

153D—Meda loam, 2 to 20 percent slopes

Composition

Meda soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Alluvial fans and terraces
Parent material: Mixed alluvium
Elevation: 20 to 1,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—60 to 90 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—160 to 240 days

Typical Profile

0 to 22 inches—very dark grayish brown and dark brown loam
22 to 31 inches—dark yellowish brown clay loam
31 to 51 inches—dark yellowish brown very gravelly sandy loam and gravelly sandy loam
51 to 60 inches—yellowish brown silt loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 8.5 inches

Contrasting Inclusions

• Wintley soils
• Kirkendall and Nekoma soils on flood plains
• Natal soils in concave positions
• Soils that are similar to this Meda soil but have more than 35 percent rock fragments and are in more steeply sloping positions
• Meda soils that have slopes of more than 20 percent

Major Uses

Woodland and wildlife habitat

Major Management Limitations

• Hazards of compaction and erosion
• Plant competition

Use and Management

Woodland

• Use conventional equipment in harvesting, but limit its use when the soil is wet.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

154B—Medford clay loam, 0 to 7 percent slopes

Composition

Medford soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Hills
Landscape position: Low terraces and alluvial fans
Parent material: Mixed alluvium
Elevation: 800 to 1,600 feet

Native plants: Douglas fir and Oregon white oak with an understory of Pacific poison oak, common snowberry, creambush oceanspray, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 45 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 8 inches—very dark brown clay loam
8 to 17 inches—very dark brown clay
17 to 53 inches—very dark grayish brown clay
53 to 60 inches—dark brown clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 48 to 72 inches in December through April
Permeability: Moderately slow
Available water capacity: About 9 inches
Shrink-swell potential: High

Contrasting Inclusions

- Foehlin soils
- Banning and Panther soils in concave positions
- Packard soils in convex positions
- Medford soils that have slopes of more than 7 percent

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

- Hazards of compaction and erosion
- Moderately slow permeability
- High shrink-swell potential
- Low soil strength

Use and Management

Cropland

- Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Leveling is needed in sloping areas.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
- Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.

154C—Medford clay loam, 7 to 15 percent slopes

Composition

Medford soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Hills
Landscape position: Alluvial fans
Parent material: Mixed alluvium
Elevation: 800 to 1,600 feet
Native plants: Douglas fir and Oregon white oak with an understory of Pacific poison oak, common snowberry, creambush oceanspray, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 45 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 8 inches—very dark brown clay loam
8 to 17 inches—very dark brown clay

17 to 53 inches—very dark grayish brown clay
53 to 60 inches—dark brown clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 48 to 72 inches in December through April
Permeability: Moderately slow
Available water capacity: About 9 inches
Shrink-swell potential: High

Contrasting Inclusions

- Foehlin soils
- Banning and Panther soils in concave positions
- Medford soils that have slopes of less than 7 percent or more than 15 percent

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Moderately slow permeability
- High shrink-swell potential
- Low soil strength

Use and Management

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
- Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
- Seed cuts and fills to permanent vegetation.

155E—Mellowmoon-Illahee complex, 3 to 30 percent slopes

Composition

Mellowmoon soil and similar inclusions—55 percent
Illahee soil and similar inclusions—35 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Ridges and side slopes
Parent material: Colluvium and residuum derived from volcanic rock
Elevation: 2,800 to 4,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, vine maple, Pacific rhododendron, and cascade Oregongrape
Climatic factors:
Mean annual precipitation—60 to 80 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Mellowmoon Soil

Typical profile

0 to 8 inches—dark brown gravelly loam
8 to 13 inches—dark brown loam
13 to 39 inches—dark yellowish brown clay loam
39 to 60 inches—dark yellowish brown gravelly clay loam and gravelly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained

Permeability: Moderate
Available water capacity: About 10.5 inches

Illahee Soil

Typical profile

0 to 10 inches—black very gravelly loam
10 to 47 inches—very dark brown to dark brown very gravelly loam
47 to 60 inches—dark yellowish brown very cobbly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 6 inches

Contrasting Inclusions

- Scaredman soils in convex, more steeply sloping positions
- Soils that are similar to the Mellowmoon soil but are poorly drained and are in concave positions and near drainageways
- Mellowmoon and Illahee soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Mellowmoon and Illahee

- Hazard of erosion
- Plant competition
- Steepness of slope

Illahee

- High amount of rock fragments on the surface and in the soil
- Seedling mortality

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Illahee soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Air drainage may be restricted on this unit; therefore, timber harvesting methods should be designed to minimize the effect of frost on regeneration.

156G—Millicoma-Reedsport complex, 60 to 90 percent slopes

Composition

Millicoma soil and similar inclusions—50 percent
Reedsport soil and similar inclusions—30 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from sandstone
Elevation: 50 to 1,500 feet
Native plants: Douglas fir and western hemlock with an understory of salal, salmonberry, cascade Oregongrape, and vine maple
Climatic factors:
Mean annual precipitation—70 to 90 inches
Mean annual air temperature—49 to 53 degrees F
Frost-free period—145 to 240 days

Millicoma Soil

Typical profile

0 to 10 inches—very dark brown and dark brown gravelly loam
10 to 30 inches—dark yellowish brown very gravelly loam
30 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 3 inches

Reedsport Soil

Typical profile

0 to 5 inches—very dark grayish brown gravelly loam
5 to 25 inches—dark brown loam
25 to 32 inches—dark brown clay loam
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 4 inches

Contrasting Inclusions

- Rock outcrop in convex, more steeply sloping positions
- Salander, Svensen, and Templeton soils in concave, less sloping positions
- Soils that are similar to the Millicoma soil but have bedrock at a depth of more than 40 inches
- Millicoma and Reedsport soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Millicoma and Reedsport

- Steepness of slope
- Hazard of slope failure
- Hazards of erosion and compaction
- Plant competition
- Hazard of windthrow
- Depth to rock

Millicoma

- High amount of rock fragments in the soil

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on the Millicoma soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

157A—Natal clay loam, 0 to 3 percent slopes

Composition

Natal soil and similar inclusions—90 percent
Contrasting inclusions—10 percent

Setting

Landform: Terraces
Landscape position: High terraces
Parent material: Clayey alluvium
Elevation: 50 to 700 feet
Native plants: Oregon ash and red alder with an understory of western swordfern, salmonberry, rushes, and sedges
Climatic factors:
Mean annual precipitation—60 to 90 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—160 to 240 days

Typical Profile

0 to 11 inches—very dark gray clay loam
11 to 33 inches—grayish brown clay
33 to 45 inches—grayish brown clay
45 to 60 inches—gray clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Poorly drained
Depth to water table: At the surface to a depth of 12 inches below the surface in December through April
Permeability: Slow

Available water capacity: About 10 inches
Shrink-swell potential: High

Contrasting Inclusions

- Bickford soils
- Kirkendall and Nekoma soils on flood plains
- Meda soils in more steeply sloping positions
- Natal soils that are flooded

Major Uses

Wildlife habitat and wetland management

Major Management Limitations

- Wetness
- Hazard of compaction
- Slow permeability
- High shrink-swell potential
- Low soil strength

158A—Natroy clay, 0 to 2 percent slopes

Composition

Natroy soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills
Landscape position: Intermediate terraces and alluvial fans
Parent material: Clayey alluvium
Elevation: 500 to 1,000 feet
Native plants: Oregon white oak and Oregon ash with an understory of common snowberry, Pacific poison oak, rose, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 18 inches—very dark grayish brown and very dark gray clay
18 to 40 inches—very dark grayish brown clay
40 to 53 inches—dark brown clay
53 to 60 inches—dark yellowish brown gravelly clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Poorly drained
Depth to water table: 12 inches above the surface to a depth of 12 inches below the surface in November through May
Permeability: Very slow
Available water capacity: About 9 inches
Shrink-swell potential: High

Contrasting Inclusions

- Curtin soils in more steeply sloping positions
- Dixonville and Philomath soils in convex, more steeply sloping positions

Major Uses

Hay and pasture, homesite development, and wetland management

Major Management Limitations

- Wetness
- High shrink-swell potential
- Very slow permeability
- Hazard of compaction
- High clay content
- Low soil strength

Use and Management

Hay and pasture

- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate wetness.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- In many areas, it may be necessary to haul in topsoil for lawns and gardens.
- This soil generally is not suitable for septic tank absorption fields; however, areas of suitable included soils may be in the unit. Onsite investigation is needed to locate these areas.
- Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
- Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing

foundations and footings, and diverting runoff away from buildings.
• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.

159C—Nekia silty clay loam, 2 to 12 percent slopes

Composition

Nekia soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Hills
Landscape position: Ridges and toeslopes
Parent material: Residuum and colluvium derived from basalt
Elevation: 400 to 2,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 225 days

Typical Profile

0 to 8 inches—dark reddish brown silty clay loam
8 to 19 inches—dark reddish brown silty clay
19 to 29 inches—dark reddish brown gravelly clay
29 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4.5 inches

Contrasting Inclusions

• Jory soils in concave positions
• Ritner and similar soils that are more than 40 inches deep to bedrock and are in convex, more steeply sloping positions
• Yoncalla soils in concave positions
• Nekia soils that have slopes of more than 12 percent

Major Uses

Cropland, pasture, and woodland

Major Management Limitations

• Hazards of compaction and erosion
• Plant competition
• Moderately slow permeability
• Hazard of windthrow
• Depth to rock
• Low soil strength

Use and Management

Cropland

• Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

• Use conventional equipment in harvesting, but limit its use when the soil is wet.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial

reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

159D—Nekia silty clay loam, 12 to 20 percent slopes

Composition

Nekia soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Hills
Landscape position: Ridges and footslopes
Parent material: Residuum and colluvium derived from basalt
Elevation: 400 to 2,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 225 days

Typical Profile

0 to 8 inches—dark reddish brown silty clay loam
8 to 19 inches—dark reddish brown silty clay
19 to 29 inches—dark reddish brown gravelly clay
29 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4.5 inches

Contrasting Inclusions

• Jory soils in concave positions
• Ritner and similar soils that are more than 40 inches deep to bedrock and are in convex, more steeply sloping positions
• Yoncalla soils in concave positions
• Nekia soils that have slopes of less than 12 percent or more than 20 percent

Major Uses

Cropland, pasture, and woodland

Major Management Limitations

• Hazards of erosion and compaction
• Steepness of slope
• Plant competition
• Moderately slow permeability
• Hazard of windthrow
• Depth to rock
• Low soil strength

Use and Management

Cropland

• Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

• Use conventional equipment in harvesting, but limit its use when the soil is wet.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants limit natural or artificial

reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

159E—Nekia silty clay loam, 20 to 30 percent slopes

Composition

Nekia soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Hills
Landscape position: Side slopes and ridges
Parent material: Residuum and colluvium derived from basalt
Elevation: 400 to 2,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 225 days

Typical Profile

0 to 8 inches—dark reddish brown silty clay loam
8 to 19 inches—dark reddish brown silty clay
19 to 29 inches—dark reddish brown gravelly clay
29 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4.5 inches

Contrasting Inclusions

• Jory soils in concave positions
• Ritner and similar soils that are more than 40 inches deep to bedrock and are in convex, more steeply sloping positions
• Yoncalla soils in concave positions
• Nekia soils that have slopes of less than 20 percent or more than 30 percent

Major Uses

Cropland, pasture, and woodland

Major Management Limitations

• Steepness of slope
• Hazards of erosion and compaction
• Plant competition
• Moderately slow permeability
• Hazard of windthrow
• Depth to rock
• Low soil strength

Use and Management

Cropland

• Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings on south- and west-

facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

160E—Nekia-Jory complex, 30 to 60 percent slopes

Composition

Nekia soil and similar inclusions—60 percent
Jory soil and similar inclusions—30 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Nekia—convex side slopes and ridges; Jory—concave side slopes
Parent material: Colluvium and residuum derived from basalt
Elevation: 400 to 2,200 feet
Native plants: Douglas fir and grand fir with an understory of salal, cascade Oregongrape, western swordfern, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 225 days

Nekia Soil

Typical profile

0 to 8 inches—dark reddish brown silty clay loam
8 to 19 inches—dark reddish brown silty clay
19 to 29 inches—dark reddish brown gravelly clay
29 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4.5 inches

Jory Soil

Typical profile

0 to 16 inches—dark reddish brown silty clay loam
16 to 24 inches—dark reddish brown silty clay
24 to 60 inches—dark red silty clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

• Ritner soils in convex, more steeply sloping positions
• Yoncalla soils in concave, less sloping positions
• Nekia and Jory soils that have slopes of less than 30 percent or more than 60 percent

Major Uses

Woodland and pasture

Major Management Limitations

Nekia and Jory

• Steepness of slope
• Hazards of erosion and compaction
• Plant competition
• Moderately slow permeability
• Low soil strength

Nekia

• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees on the Nekia soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.
- Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

161A—Nekoma-Gardiner complex, 0 to 3 percent slopes

Composition

Nekoma soil and similar inclusions—45 percent
Gardiner soil and similar inclusions—35 percent
Contrasting inclusions—20 percent

Setting

Landform: Flood plains
Landscape position: Low flood plains
Parent material: Mixed alluvium
Elevation: 20 to 50 feet
Native plants: Douglas fir, red alder, and bigleaf maple with an understory of western swordfern, vine maple, and creambush oceanspray
Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—51 to 53 degrees F
Frost-free period—160 to 240 days

Nekoma Soil

Typical profile

0 to 14 inches—very dark brown and dark brown silt loam
14 to 27 inches—dark yellowish brown silt loam
27 to 32 inches—dark yellowish brown very fine sandy loam
32 to 60 inches—dark yellowish brown fine sand

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Depth to water table: 48 to 72 inches in November through April
Permeability: Moderate
Available water capacity: About 8 inches
Frequency of flooding: Frequent in December through April

Gardiner Soil

Typical profile

0 to 8 inches—dark brown fine sandy loam
8 to 60 inches—dark yellowish brown loamy fine sand

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 6.5 inches
Frequency of flooding: Frequent in December through April

Contrasting Inclusions

- Kirkendall soils on higher flood plains
- Meda soils on terraces and alluvial fans
- Quosatana soils in swales

Major Uses

Hay and pasture, and wildlife habitat

Major Management Limitations

Nekoma and Gardiner

- Hazard of flooding
- Hazard of compaction
- Coarse texture

Gardiner

- Moderately rapid permeability

Use and Management

Hay and pasture

- Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Reduce the risk of erosion by providing structures along streambanks to control the flow of water and by planting cover crops.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soils, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.

• Cross-fencing, water developments, and placement of salt improve livestock distribution.

162A—Nestucca silt loam, 0 to 3 percent slopes

Composition

Nestucca soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Flood plains
Landscape position: Low flood plains
Parent material: Mixed alluvium
Elevation: 10 to 40 feet
Native plants: Sitka spruce, red alder, and bigleaf maple with an understory of vine maple, western swordfern, and salmonberry
Climatic factors:
Mean annual precipitation—70 to 90 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—180 to 240 days

Typical Profile

0 to 15 inches—very dark grayish brown silt loam
15 to 30 inches—dark grayish brown silty clay loam
30 to 60 inches—gray silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 12 to 24 inches in December through April
Permeability: Moderately slow
Available water capacity: About 12 inches
Frequency of flooding: Frequent in December through April

Contrasting Inclusions

• Yachats soils
• Coquille and Willanch soils on lower flood plains
• Lint soils on terraces
• Soils that are similar to this Nestucca soil but are well drained and are on higher flood plains

Major Uses

Hay and pasture, and wildlife habitat

Major Management Limitations

• Hazard of flooding
• Wetness
• Hazard of compaction
• Moderately slow permeability
• Low soil strength

Use and Management

Hay and pasture

• Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to control runoff and erosion.
• Reduce the risk of erosion by providing structures along streambanks to control the flow of water and by planting cover crops.
• Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Select plants that can tolerate wetness.
• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

163C—Netarts fine sand, 2 to 12 percent slopes

Composition

Netarts soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Dunes
Landscape position: Stabilized sand dunes
Parent material: Eolian sand
Elevation: 50 to 300 feet
Native plants: Western hemlock and Douglas fir with an understory of evergreen huckleberry, salal, and Pacific rhododendron
Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—51 to 53 degrees F
Frost-free period—180 to 240 days

Typical Profile

0 to 5 inches—dark grayish brown fine sand

5 to 30 inches—brown, light yellowish brown, and light olive brown fine sand
30 to 63 inches—light olive brown fine sand

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 4.5 inches
Hazard of wind erosion: High

Contrasting Inclusions

- Waldport soils on recently stabilized dunes
- Duneland
- Netarts soils that have slopes of more than 12 percent

Major Uses

Recreation, wildlife habitat, woodland, and homesite development

Major Management Limitations

- Hazard of wind erosion
- Coarse texture
- Plant competition
- Seedling mortality
- Droughtiness

Use and Management

Recreation and homesite development

- Reduce the risk of wind erosion by maintaining plant cover, revegetating disturbed areas as soon as possible, surfacing paths, and controlling traffic.
- Establish and maintain plant cover by fertilizing, seeding, and mulching and by shaping the slopes.
- Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.
- Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
- In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

Woodland

- Use conventional equipment in harvesting, but limit its use when the soil is saturated or very dry.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- When the soil is dry, landings can be ripped to improve plant growth.
- Reduce the risk of wind erosion by seeding roads, roadcuts, roadfills, skid trails, and landings.
- Proper design of road drainage systems and care in the placement of culverts help to control water erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

163E—Netarts fine sand, 12 to 30 percent slopes

Composition

Netarts soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Dunes
Landscape position: Stabilized sand dunes
Parent material: Eolian sand
Elevation: 50 to 300 feet
Native plants: Western hemlock and Douglas fir with an understory of evergreen huckleberry, salal, and Pacific rhododendron
Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—51 to 53 degrees F
Frost-free period—180 to 240 days

Typical Profile

0 to 5 inches—dark grayish brown fine sand
5 to 30 inches—light yellowish brown and light olive brown fine sand
30 to 63 inches—light olive brown fine sand

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 4.5 inches
Hazard of wind erosion: High

Contrasting Inclusions

- Waldport soils on recently stabilized dunes
- Duneland
- Netarts soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Recreation, wildlife habitat, woodland, and homesite development

Major Management Limitations

- Hazard of wind erosion
- Steepness of slope
- Coarse texture
- Hazard of soil displacement
- Plant competition
- Seedling mortality
- Droughtiness

Use and Management

Recreation and homesite development

- Reduce the risk of wind erosion by maintaining plant cover, revegetating disturbed areas as soon as possible, surfacing paths, and controlling traffic.
- Establish and maintain plant cover by fertilizing, seeding, and mulching and by shaping the slopes.
- Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity. Limit its use when the soil is saturated or very dry.
- When the soil is dry, landings can be ripped to improve plant growth.
- Reduce the risk of wind erosion by seeding roads, roadcuts, roadfills, skid trails, and landings.
- Proper design of road drainage systems and care in the placement of culverts help to control water erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

164A—Newberg fine sandy loam, 0 to 3 percent slopes

Composition

Newberg soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Flood plains
Landscape position: Low flood plains
Parent material: Mixed alluvium
Elevation: 100 to 1,700 feet
Native plants: Black cottonwood and willow with an understory of common snowberry, mockorange, and western hazel
Climatic factors:
Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 4 inches—very dark grayish brown fine sandy loam
4 to 19 inches—dark brown fine sandy loam
19 to 35 inches—dark yellowish brown fine sandy loam
35 to 60 inches—dark yellowish brown loamy fine sand

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 7 inches
Frequency of flooding: Occasional in December through March

Contrasting Inclusions

- Evans soils
- Camas soils on bars or in channels
- Riverwash on lower flood plains
- Soils that are similar to this Newberg soil but are poorly drained
- Newberg soils that have a loamy sand surface layer

Major Uses

Cropland and pasture

Major Management Limitations

- Hazard of flooding
- Hazard of compaction
- Coarse texture

Use and Management

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Reduce the risk of erosion by providing structures along streambanks to control the flow of water and by planting cover crops.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risk of compaction of the surface layer by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

165A—Newberg loamy sand, 0 to 3 percent slopes

Composition

Newberg soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Flood plains
Landscape position: Low flood plains
Parent material: Mixed alluvium
Elevation: 100 to 1,700 feet
Native plants: Black cottonwood and willow with an understory of common snowberry, mockorange, and western hazel
Climatic factors:
Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 8 inches—very dark grayish brown loamy sand
8 to 30 inches—very dark grayish brown fine sandy loam
30 to 60 inches—dark brown fine sand

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 6 inches
Frequency of flooding: Occasional in December through March

Contrasting Inclusions

- Evans soils
- Camas soils on bars or in channels
- Riverwash on lower flood plains
- Soils that are similar to this Newberg soil but are poorly drained
- Newberg soils that have a fine sandy loam surface layer

Major Uses

Cropland and pasture

Major Management Limitations

- Hazard of flooding
- Coarse texture

Use and Management

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Reduce the risk of erosion by providing structures along streambanks to control the flow of water and by planting cover crops.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce runoff and soil displacement and maintain soil tilth by planning grazing systems, using proper stocking rates, and limiting grazing and field operations when the soil is saturated or very dry.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

166C—Nonpareil loam, 3 to 12 percent slopes

Composition

Nonpareil soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Ridges and toeslopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Oregon white oak and Pacific madrone with an understory of Pacific poison oak, hairy honeysuckle, Saskatoon serviceberry, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 4 inches—brown loam
4 to 17 inches—brown and dark yellowish brown loam
17 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2.5 inches

Contrasting Inclusions

- Dickerson, Oakland, and Speaker soils
- Windygap and Rosehaven soils in concave positions
- Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways
- Nonpareil soils that have slopes of more than 12 percent

Major Uses

Livestock grazing and homesite development

Major Management Limitations

- Depth to rock
- Hazards of compaction and erosion
- Droughtiness
- Low soil strength

Use and Management

Livestock grazing

- Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
- Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
- Brush management and seeding reduce competition from woody plants and improve degraded areas.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- In many areas, it may be necessary to haul in topsoil for lawns and gardens.
- This soil generally is not suitable for septic tank absorption fields; however, areas of suitable included soils may be in the unit. Onsite investigation is needed to locate these areas.
- Roads should be designed to offset the limited ability of the soil to support a load.
- Ripping and blasting are needed for road construction in some areas of this unit.

166E—Nonpareil loam, 12 to 30 percent slopes

Composition

Nonpareil soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Ridges and side slopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Oregon white oak and Pacific madrone with an understory of Pacific poison oak, hairy honeysuckle, Saskatoon serviceberry, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 4 inches—brown loam
4 to 17 inches—brown and dark yellowish brown loam
17 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2.5 inches

Contrasting Inclusions

- Dickerson, Oakland, and Speaker soils
- Windygap and Rosehaven soils in concave positions
- Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways
- Nonpareil soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Livestock grazing and homesite development

Major Management Limitations

- Depth to rock
- Hazards of erosion and compaction
- Steepness of slope
- Droughtiness
- Low soil strength

Use and Management

Livestock grazing

- Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
- Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
- Brush management and seeding reduce competition from woody plants and improve degraded areas.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- In many areas, it may be necessary to haul in topsoil for lawns and gardens.
- This soil generally is not suitable for septic tank absorption fields; however, areas of suitable included soils may be in the unit. Onsite investigation is needed to locate these areas.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the limited ability of the soil to support a load.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Ripping and blasting are needed for road construction in some areas of this unit.

167G—Nonpareil loam, 60 to 90 percent north slopes

Composition

Nonpareil soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Colluvium derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Oregon white oak and Pacific madrone with an understory of Pacific poison oak, hairy honeysuckle, Saskatoon serviceberry, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 4 inches—brown loam
4 to 17 inches—brown and dark yellowish brown loam
17 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2.5 inches

Contrasting Inclusions

- Atring, Dickerson, Oakland, and Speaker soils
- Rock outcrop in convex, more steeply sloping positions

• Windygap and Rosehaven soils in concave, less sloping positions
• Nonpareil soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Livestock grazing

Major Management Limitations

• Steepness of slope
• Depth to rock
• Hazards of erosion and compaction
• Droughtiness
• Low soil strength

Use and Management

Livestock grazing

• Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
• Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
• Brush management and seeding reduce competition from woody plants and improve degraded areas.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.
• Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

168G—Nonpareil loam, 60 to 90 percent south slopes

Composition

Nonpareil soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Colluvium derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Oregon white oak and Pacific madrone with an understory of Pacific poison oak, hairy honeysuckle, Saskatoon serviceberry, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 4 inches—brown loam
4 to 17 inches—brown and dark yellowish brown loam
17 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2.5 inches

Contrasting Inclusions

• Atring, Dickerson, Oakland, and Speaker soils
• Rock outcrop in convex, more steeply sloping positions
• Windygap and Rosehaven soils in concave, less sloping positions
• Nonpareil soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Livestock grazing

Major Management Limitations

• Steepness of slope
• Depth to rock
• Hazards of erosion and compaction
• Droughtiness
• Low soil strength

Use and Management

Livestock grazing

• Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
• Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
• Brush management and seeding reduce competition from woody plants and improve degraded areas.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.
• Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

169C—Nonpareil-Oakland complex, 3 to 12 percent slopes

Composition

Nonpareil soil and similar inclusions—45 percent
Oakland soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Ridges and toeslopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Oregon white oak and Pacific madrone with an understory of Pacific poison oak, hairy honeysuckle, Saskatoon serviceberry, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Nonpareil Soil

Typical profile

0 to 4 inches—brown loam
4 to 17 inches—brown and dark yellowish brown loam
17 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2.5 inches

Oakland Soil

Typical profile

0 to 5 inches—dark brown silt loam
5 to 20 inches—dark yellowish brown silty clay loam
20 to 24 inches—dark yellowish brown silty clay
24 to 28 inches—dark brown gravelly silty clay
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Contrasting Inclusions

- Dickerson and Speaker soils
- Bateman, Rosehaven, and Windygap soils in concave positions
- Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways
- Nonpareil and Oakland soils that have slopes of more than 12 percent

Major Uses

Hay and pasture, and homesite development

Major Management Limitations

Nonpareil and Oakland

- Hazards of compaction and erosion
- Depth to rock
- Low soil strength

Nonpareil

- Droughtiness

Use and Management

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soils and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- In areas of the Nonpareil soil, select plants that can tolerate droughtiness.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- In many areas, it may be necessary to haul in topsoil for lawns and gardens.
- This unit generally is not suitable for septic tank absorption fields; however, areas of suitable included soils may be in the unit. Onsite investigation is needed to locate these areas.
- Roads should be designed to offset the limited ability of the soils to support a load.
- Ripping and blasting are needed for road construction in some areas of this unit.

169E—Nonpareil-Oakland complex, 12 to 30 percent slopes

Composition

Nonpareil soil and similar inclusions—45 percent
Oakland soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Ridges and side slopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Oregon white oak and Pacific madrone with an understory of Pacific poison oak, hairy honeysuckle, Saskatoon serviceberry, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Nonpareil Soil

Typical profile

0 to 4 inches—brown loam
4 to 17 inches—brown and dark yellowish brown loam
17 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2.5 inches

Oakland Soil

Typical profile

0 to 5 inches—dark brown silt loam
5 to 20 inches—dark yellowish brown silty clay loam
20 to 24 inches—dark yellowish brown silty clay
24 to 28 inches—dark brown gravelly silty clay
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Contrasting Inclusions

- Dickerson and Speaker soils
- Bateman, Rosehaven, and Windygap soils in concave positions
- Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways
- Nonpareil and Oakland soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Hay and pasture, and homesite development

Major Management Limitations

Nonpareil and Oakland

- Hazards of erosion and compaction
- Steepness of slope
- Depth to rock
- Low soil strength

Nonpareil

- Droughtiness

Use and Management

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soils and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- In areas of the Nonpareil soil, select plants that can tolerate droughtiness.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- In many areas, it may be necessary to haul in topsoil for lawns and gardens.
- This unit generally is not suitable for septic tank absorption fields; however, areas of suitable included soils may be in the unit. Onsite investigation is needed to locate these areas.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.

• Roads should be designed to offset the limited ability of the soils to support a load.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Ripping and blasting are needed for road construction in some areas of this unit.

169F—Nonpareil-Oakland complex, 30 to 60 percent slopes

Composition

Nonpareil soil and similar inclusions—45 percent
Oakland soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Oregon white oak and Pacific madrone with an understory of Pacific poison oak, hairy honeysuckle, Saskatoon serviceberry, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Nonpareil Soil

Typical profile

0 to 4 inches—brown loam
4 to 17 inches—brown and dark yellowish brown loam
17 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2.5 inches

Oakland Soil

Typical profile

0 to 5 inches—dark brown silt loam
5 to 20 inches—dark yellowish brown silty clay loam
20 to 24 inches—dark yellowish brown silty clay
24 to 28 inches—dark brown gravelly silty clay
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Contrasting Inclusions

• Dickerson and Speaker soils
• Bateman, Rosehaven, and Windygap soils in concave, less sloping positions
• Atring soils in more steeply sloping positions
• Dupee and Sutherlin soils in concave, less sloping positions
• Nonpareil and Oakland soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Pasture

Major Management Limitations

Nonpareil and Oakland

• Steepness of slope
• Hazards of erosion and compaction
• Depth to rock
• Low soil strength

Nonpareil

• Droughtiness

Use and Management

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.
• Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

170C—Oakland silt loam, 3 to 12 percent slopes

Composition

Oakland soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Ridges and toeslopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Oregon white oak and Pacific madrone with an understory of Pacific poison oak, common

snowberry, Saskatoon serviceberry, and blue wildrye

Climatic factors:

Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 5 inches—dark brown silt loam
5 to 20 inches—dark yellowish brown silty clay loam
20 to 24 inches—dark yellowish brown silty clay
24 to 28 inches—dark brown gravelly silty clay
28 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Contrasting Inclusions

- Speaker soils
- Bateman and Windygap silt loams in concave positions
- Nonpareil soils in convex positions
- Dupee, Panther, Pengra, Sutherlin, and Veneta soils in concave positions and near drainageways
- Oakland soils that have slopes of more than 12 percent

Major Uses

Cropland, pasture, woodland, and homesite development

Major Management Limitations

- Hazards of compaction and erosion
- Plant competition
- Moderately slow permeability
- Hazard of windthrow
- Depth to rock
- Low soil strength

Use and Management

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

- Use conventional equipment in harvesting, but limit its use when the soil is wet.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock. Onsite investigation is needed to locate these areas.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Roads should be designed to offset the limited ability of the soil to support a load.
- Seed cuts and fills to permanent vegetation.

170D—Oakland silt loam, 12 to 20 percent slopes

Composition

Oakland soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Ridges and footslopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Oregon white oak and Pacific madrone with an understory of Pacific poison oak, common snowberry, Saskatoon serviceberry, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 5 inches—dark brown silt loam
5 to 20 inches—dark yellowish brown silty clay loam
20 to 24 inches—dark yellowish brown silty clay
24 to 28 inches—dark brown gravelly silty clay
28 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Contrasting Inclusions

- Speaker soils
- Bateman and Windygap silt loams in concave positions
- Nonpareil soils in convex positions
- Dupee, Panther, Pengra, Sutherlin, and Veneta soils in concave positions and near drainageways
- Oakland soils that have slopes of less than 12 percent or more than 20 percent

Major Uses

Cropland, pasture, woodland, and homesite development.

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Plant competition
- Moderately slow permeability
- Hazard of windthrow
- Depth to rock
- Low soil strength

Use and Management

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

- Use conventional equipment in harvesting, but limit its use when the soil is wet.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock . Onsite investigation is needed to locate these areas.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Roads should be designed to offset the limited ability of the soil to support a load.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

170E—Oakland silt loam, 20 to 30 percent slopes

Composition

Oakland soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes and ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Oregon white oak and Pacific madrone with an understory of Pacific poison oak, common snowberry, Saskatoon serviceberry, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 5 inches—dark brown silt loam
5 to 20 inches—dark yellowish brown silty clay loam
20 to 24 inches—dark yellowish brown silty clay
24 to 28 inches—dark brown gravelly silty clay
28 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Contrasting Inclusions

• Speaker soils
• Bateman and Windygap silt loams in concave positions
• Nonpareil soils in convex positions
• Dupee, Panther, Pengra, Sutherlin, and Veneta soils in concave, less sloping positions
• Oakland soils that have slopes of less than 20 percent or more than 30 percent

Major Uses

Cropland, pasture, woodland, and homesite development

Major Management Limitations

• Steepness of slope
• Hazards of erosion and compaction
• Plant competition
• Moderately slow permeability
• Hazard of windthrow
• Depth to rock
• Low soil strength

Use and Management

Cropland

• Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.

- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock. Onsite investigation is needed to locate these areas.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the limited ability of the soil to support a load.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

171F—Oakland silt loam, 30 to 60 percent north slopes

Composition

Oakland soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Douglas fir and Pacific madrone with an understory of Pacific poison oak, western swordfern, rose, and mountain brome
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 5 inches—dark brown silt loam
5 to 20 inches—dark yellowish brown silty clay loam
20 to 24 inches—dark yellowish brown silty clay
24 to 28 inches—dark brown gravelly silty clay
28 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Contrasting Inclusions

- Speaker soils
- Bateman and Windygap silt loams in concave, less sloping positions
- Dickerson and Nonpareil soils in convex, more steeply sloping positions
- Dupee, Sutherlin, and Veneta soils in concave, less sloping positions
- Oakland soils that have slopes of less than 30 percent or more than 60 percent

Major Uses

Pasture and woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Hazard of windthrow
- Depth to rock
- Low soil strength

Use and Management

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.

• Cross-fencing, water developments, and placement of salt improve livestock distribution.
• Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

172F—Oakland silt loam, 30 to 60 percent south slopes

Composition

Oakland soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Douglas fir and Pacific madrone with an understory of Pacific poison oak, hairy honeysuckle, mountain sweetroot, and mountain brome
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 5 inches—dark brown silt loam
5 to 20 inches—dark yellowish brown silty clay loam
20 to 24 inches—dark yellowish brown silty clay
24 to 28 inches—dark brown gravelly silty clay
28 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Contrasting Inclusions

• Speaker soils
• Bateman and Windygap silt loams in concave, less sloping positions
• Dickerson and Nonpareil soils in convex, more steeply sloping positions
• Dupee, Sutherlin, and Veneta soils in concave, less sloping positions
• Oakland soils that have slopes of less than 30 percent or more than 60 percent

Major Uses

Pasture and woodland

Major Management Limitations

• Steepness of slope
• Hazards of erosion and compaction
• Plant competition
• Seedling mortality
• Moderately slow permeability
• Hazard of windthrow
• Depth to rock
• Low soil strength

Use and Management

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.
• Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.

- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

173E—Oakland-Dupee complex, 12 to 30 percent slopes

Composition

Oakland soil and similar inclusions—40 percent
Dupee soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Oakland—footslopes and convex side slopes; Dupee—footslopes and concave side slopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 300 to 2,500 feet
Native plants: Oakland—Oregon white oak, Pacific madrone, and Douglas fir with an understory of Pacific poison oak, common snowberry, Saskatoon serviceberry, and blue wildrye; Dupee—Oregon white oak and Douglas fir with an understory of Pacific poison oak, common snowberry, rose, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Oakland Soil

Typical profile

0 to 5 inches—dark brown silt loam
5 to 20 inches—dark yellowish brown silty clay loam
20 to 24 inches—dark yellowish brown silty clay
24 to 28 inches—dark brown gravelly silty clay
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Dupee Soil

Typical profile

0 to 9 inches—dark brown silty clay loam
9 to 30 inches—dark brown silty clay
30 to 63 inches—mottled, dark brown and yellowish brown clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 18 to 36 inches in December through April
Permeability: Moderately slow
Available water capacity: About 11 inches

Contrasting Inclusions

- Nonpareil soils in convex, more steeply sloping positions
- Bateman, Speaker, and Windygap soils in convex positions
- Sutherlin soils in concave positions
- Pengra soils in concave, less sloping positions
- Panther soils near drainageways
- Oakland and Dupee soils that have slopes of less than 12 percent
- Oakland soils that have slopes of more than 30 percent

Major Uses

Hay and pasture, homesite development, and woodland

Major Management Limitations

Oakland and Dupee

- Hazards of erosion and compaction
- Steepness of slope
- Moderately slow permeability
- Low soil strength
- Hazard of windthrow

Oakland

- Depth to rock
- Plant competition

Dupee

- Wetness
- Hazard of slope failure

Use and Management

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soils and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- In areas of the Dupee soil, select plants that can tolerate wetness.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock or are better drained. Onsite investigation is needed to locate these areas.
- Interceptor ditches can be used to divert subsurface water away from the absorption field.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Reduce wetness of the Dupee soil by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
- Roads should be designed to offset the limited ability of the soils to support a load.
- Slumping can be minimized by restricting the construction of roads and other activities that disturb the soils to the less sloping or better drained areas and by using properly designed road drainage systems.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

Woodland

- Because the Dupee soil is unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping or better drained areas and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

174E—Oakland-Nonpareil-Sutherlin complex, 12 to 30 percent slopes

Composition

Oakland soil and similar inclusions—40 percent
Nonpareil soil and similar inclusions—25 percent
Sutherlin soil and similar inclusions—15 percent
Contrasting inclusions—20 percent

Setting

Landform: Hills
Landscape position: Oakland—footslopes and convex side slopes; Nonpareil—convex side slopes; Sutherlin—footslopes and concave side slopes
Parent material: Oakland and Nonpareil—residuum and colluvium derived from sandstone and

siltstone; Sutherlin—alluvium and colluvium derived from sandstone and siltstone
Elevation: 300 to 2,000 feet
Native plants: Oregon white oak, Pacific madrone, and Douglas fir with an understory of Pacific poison oak, common snowberry, Saskatoon serviceberry, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Oakland Soil

Typical profile

0 to 5 inches—dark brown silt loam
5 to 20 inches—dark yellowish brown silty clay loam
20 to 24 inches—dark yellowish brown silty clay
24 to 28 inches—dark brown gravelly silty clay
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Nonpareil Soil

Typical profile

0 to 4 inches—brown loam
4 to 17 inches—brown and dark yellowish brown loam
17 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2.5 inches

Sutherlin Soil

Typical profile

0 to 16 inches—dark brown and dark yellowish brown silt loam
16 to 30 inches—dark yellowish brown silty clay loam
30 to 43 inches—dark yellowish brown and yellowish brown silty clay
43 to 60 inches—mottled, yellowish brown silty clay

Properties and qualities

Depth to clay layer: 24 to 36 inches
Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 18 to 36 inches in November through April
Permeability: Moderately slow above the clay layer and very slow through it
Available water capacity: About 10 inches
Shrink-swell potential: High

Contrasting Inclusions

- Speaker soils
- Bateman and Windygap silt loams in concave positions
- Dupee and Veneta soils in concave positions and near drainageways
- Oakland, Nonpareil, and Sutherlin soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Hay and pasture, homesite development, and woodland

Major Management Limitations

Oakland, Nonpareil, and Sutherlin

- Hazards of erosion and compaction
- Steepness of slope
- Low soil strength
- Hazard of windthrow

Oakland

- Moderately slow permeability
- Depth to rock
- Plant competition

Nonpareil

- Depth to rock
- Droughtiness

Sutherlin

- Wetness
- Depth to clay layer
- Very slow permeability and high shrink-swell potential of clay layer
- Hazard of slope failure
- Plant competition
- Seedling mortality

Use and Management

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soils and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.

• Tillage and seeding should be done on the contour or across the slope where practical.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• In many areas, it may be necessary to haul in topsoil for lawns and gardens.
• Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock or to a clay layer. Onsite investigation is needed to locate these areas.
• Interceptor ditches can be used to divert subsurface water away from the absorption field.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Roads should be designed to offset the effects of shrinking and swelling in areas of the Sutherlin soil and the limited ability of the soils in this unit to support a load.
• In areas of the Sutherlin soil, prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• Slumping can be minimized by restricting the construction of roads and other activities that disturb the soil to the less sloping or more well drained areas and by using properly designed road drainage systems.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

Woodland

• Because the Sutherlin soil is unsuited to traffic when wet, use equipment only during dry periods.
• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

174F—Oakland-Nonpareil-Sutherlin complex, 30 to 60 percent slopes

Composition

Oakland soil and similar inclusions—40 percent
Nonpareil soil and similar inclusions—25 percent
Sutherlin soil and similar inclusions—15 percent
Contrasting inclusions—20 percent

Setting

Landform: Hills
Landscape position: Oakland—side slopes; Nonpareil—convex side slopes; Sutherlin—concave side slopes
Parent material: Oakland and Nonpareil—residuum and colluvium derived from sandstone and siltstone; Sutherlin—alluvium and colluvium derived from sandstone and siltstone
Elevation: 300 to 2,000 feet
Native plants: Oregon white oak, Pacific madrone, and Douglas fir with an understory of Pacific poison oak, hairy honeysuckle, mountain sweetroot, and mountain brome
Climatic factors:
Mean annual precipitation—30 to 55 inches

Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Oakland Soil

Typical profile

0 to 5 inches—dark brown silt loam
5 to 20 inches—dark yellowish brown silty clay loam
20 to 24 inches—dark yellowish brown silty clay
24 to 28 inches—dark brown gravelly silty clay
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Nonpareil Soil

Typical profile

0 to 4 inches—brown loam
4 to 17 inches—brown and dark yellowish brown loam
17 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2.5 inches

Sutherlin Soil

Typical profile

0 to 16 inches—dark brown and dark yellowish brown silt loam
16 to 30 inches—dark yellowish brown silty clay loam
30 to 43 inches—mottled, dark yellowish brown and yellowish brown silty clay
43 to 60 inches—mottled, yellowish brown and light brownish gray silty clay

Properties and qualities

Depth to clay layer: 24 to 36 inches
Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 18 to 36 inches in November through April
Permeability: Moderately slow above the clay layer and very slow through it
Available water capacity: About 10 inches
Shrink-swell potential: High

Contrasting Inclusions

- Speaker soils
- Bateman and Windygap silt loams in concave, less sloping positions
- Dupee and Veneta soils in concave, less sloping positions
- Sutherlin soils that have slopes of less than 30 percent
- Oakland and Nonpareil soils that have slopes of less than 30 percent or more than 60 percent

Major Uses

Pasture and woodland

Major Management Limitations

Oakland, Nonpareil, and Sutherlin

- Steepness of slope
- Hazards of erosion and compaction
- Low soil strength
- Hazard of windthrow

Oakland

- Moderately slow permeability
- Depth to rock
- Plant competition

Nonpareil

- Depth to rock
- Droughtiness

Sutherlin

- Wetness
- Hazard of slope failure
- Depth to clay layer
- High shrink-swell potential and very slow permeability of clay layer
- Plant competition
- Seedling mortality

Use and Management

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.
- Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

Woodland

- Because the Sutherlin soil is unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.

- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Avoiding very wet areas, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

175E—Oakland-Sutherlin complex, 12 to 30 percent slopes

Composition

Oakland soil and similar inclusions—50 percent
Sutherlin soil and similar inclusions—35 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills
Landscape position: Oakland—footslopes and convex side slopes; Sutherlin—footslopes and concave side slopes
Parent material: Oakland—residuum and colluvium derived from sandstone and siltstone; Sutherlin—alluvium and colluvium derived from sandstone and siltstone
Elevation: 300 to 2,000 feet
Native plants: Oregon white oak, Pacific madrone, and Douglas fir with an understory of Pacific poison oak, common snowberry, Saskatoon serviceberry, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Oakland Soil

Typical profile

0 to 5 inches—dark brown silt loam
5 to 20 inches—dark yellowish brown silty clay loam
20 to 24 inches—dark yellowish brown silty clay
24 to 28 inches—dark brown gravelly silty clay
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Sutherlin Soil

Typical profile

0 to 16 inches—dark brown and dark yellowish brown silt loam
16 to 30 inches—dark yellowish brown silty clay loam
30 to 43 inches—mottled, dark yellowish brown and yellowish brown silty clay
43 to 60 inches—mottled, yellowish brown and light brownish gray silty clay

Properties and qualities

Depth to clay layer: 24 to 36 inches
Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 18 to 36 inches in November through April
Permeability: Moderately slow above the clay layer and very slow through it
Available water capacity: About 10 inches
Shrink-swell potential: High

Contrasting Inclusions

- Speaker soils
- Bateman and Windygap silt loams in concave positions
- Nonpareil soils in convex positions
- Dupee and Veneta soils in concave positions and near drainageways
- Oakland and Sutherlin soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Hay and pasture, homesite development, and woodland

Major Management Limitations

Oakland and Sutherlin

- Hazards of erosion and compaction
- Steepness of slope
- Low soil strength
- Plant competition
- Hazard of windthrow

Oakland

- Moderately slow permeability
- Depth to rock

Sutherlin

- Wetness
- Depth to clay layer
- High shrink-swell potential and very slow permeability of clay layer
- Hazard of slope failure
- Seedling mortality

Use and Management

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soils and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock or to a clay layer. Onsite investigation is needed to locate these areas.
- Interceptor ditches can be used to divert subsurface water away from the absorption field.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the effects of shrinking and swelling in areas of the Sutherlin soil and the limited ability of the soils in this unit to support a load.
- In areas of the Sutherlin soil, prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
- Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
- Slumping can be minimized by restricting the construction of roads and other activities that disturb the soils to the less sloping or more well drained areas and by using properly designed road drainage systems.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

Woodland

- Because the Sutherlin soil is unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-

facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

176F—Oneonta-Hummington complex, 30 to 60 percent north slopes

Composition

Oneonta soil and similar inclusions—40 percent
Hummington soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 3,800 to 4,800 feet
Native plants: Pacific silver fir and Douglas fir with an understory of Pacific rhododendron, golden chinkapin, cascade Oregongrape, and vine maple
Climatic factors:
Mean annual precipitation—65 to 80 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Oneonta Soil

Typical profile

0 to 5 inches—very dark brown gravelly loam
5 to 18 inches—very dark brown and dark brown loam
18 to 34 inches—dark brown loam
34 to 60 inches—dark yellowish brown loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 13.5 inches

Hummington Soil

Typical profile

0 to 6 inches—very dark brown very gravelly loam
6 to 16 inches—very dark brown very gravelly loam
16 to 22 inches—very dark grayish brown extremely cobbly loam
22 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 6 inches

Contrasting Inclusions

• Keel soils
• Rock outcrop in convex, more steeply sloping positions
• Soils that are similar to the Hummington soil but have bedrock at a depth of less than 20 inches and are in convex, more steeply sloping positions
• Soils that are similar to the Hummington soil but have bedrock at a depth of more than 40 inches
• Oneonta soils that have slopes of less than 30 percent
• Hummington soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Oneonta and Hummington

• Steepness of slope
• Hazard of erosion
• Plant competition

Hummington

• High amount of rock fragments on the surface and in the soil
• Seedling mortality
• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on the Hummington soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial

reforestation unless intensive site preparation and maintenance are used.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees on the Hummington soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

177F—Oneonta-Hummington complex, 30 to 60 percent south slopes

Composition

Oneonta soil and similar inclusions—40 percent
Hummington soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 4,000 to 4,800 feet
Native plants: Pacific silver fir and Douglas fir with an understory of Pacific rhododendron, golden chinkapin, cascade Oregongrape, and vine maple
Climatic factors:
Mean annual precipitation—65 to 80 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Oneonta Soil

Typical profile

0 to 5 inches—very dark brown gravelly loam
5 to 18 inches—very dark brown and dark brown loam
18 to 34 inches—dark brown loam
34 to 60 inches—dark yellowish brown loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 13.5 inches

Hummington Soil

Typical profile

0 to 6 inches—very dark brown very gravelly loam
6 to 16 inches—very dark brown very gravelly loam
16 to 22 inches—very dark grayish brown extremely cobbly loam
22 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 6 inches

Contrasting Inclusions

• Keel soils
• Rock outcrop in convex, more steeply sloping positions
• Soils that are similar to the Hummington soil but have bedrock at a depth of less than 20 inches and are in convex, more steeply sloping positions
• Soils that are similar to the Hummington soil but have bedrock at a depth of more than 40 inches
• Oneonta soils that have slopes of less than 30 percent
• Hummington soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Oneonta and Hummington

• Steepness of slope
• Hazard of erosion
• Plant competition

Hummington

• High amount of rock fragments on the surface and in the soil
• Seedling mortality
• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on the Hummington soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.

• Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Trees on the Hummington soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

178E—Oneonta-Keel complex, 3 to 30 percent slopes

Composition

Oneonta soil and similar inclusions—55 percent
Keel soil and similar inclusions—25 percent
Contrasting inclusions—20 percent

Setting

Landform: Plateaus
Landscape position: Broad ridges
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 4,000 to 4,800 feet
Native plants: Pacific silver fir and Douglas fir with an understory of Pacific rhododendron, golden chinkapin, cascade Oregongrape, and vine maple
Climatic factors:
Mean annual precipitation—65 to 80 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Oneonta Soil

Typical profile

0 to 5 inches—very dark brown gravelly loam
5 to 18 inches—very dark brown and dark brown loam
18 to 34 inches—dark brown loam
34 to 60 inches—dark yellowish brown loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 13.5 inches

Keel Soil

Typical profile

0 to 6 inches—very dark brown gravelly silt loam
6 to 17 inches—dark brown gravelly loam
17 to 22 inches—dark brown cobbly loam
22 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 6 inches

Contrasting Inclusions

• Hummington soils in convex, more steeply sloping positions
• Soils that are similar to the Oneonta soil but have more than 35 percent rock fragments
• Soils that are similar to the Oneonta soil but are poorly drained and are in concave positions
• Oneonta and Keel soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Oneonta and Keel

- Hazard of erosion
- Plant competition
- Steepness of slope

Keel

- Depth to rock

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Air drainage may be restricted on this unit; therefore, timber harvesting methods should be designed to minimize the effect of frost on regeneration.

179E—Orford gravelly silt loam, 3 to 30 percent slopes

Composition

Orford soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Coast Range Mountains
Landscape position: Ridges and side slopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 100 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Typical Profile

0 to 12 inches—very dark grayish brown and dark brown gravelly silt loam
12 to 22 inches—dark brown silty clay loam
22 to 52 inches—brown clay
52 to 60 inches—strong brown silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Contrasting Inclusions

- Fernhaven and Preacher soils
- Bohannon, Digger, and McDuff soils in convex, more steeply sloping positions
- Soils that are similar to the Orford soil but are poorly drained and are in concave positions and near drainageways
- Orford soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

- Hazards of compaction and erosion
- Plant competition
- Steepness of slope
- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

179F—Orford gravelly silt loam, 30 to 60 percent slopes

Composition

Orford soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Coast Range Mountains
Landscape position: Side slopes and ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 100 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Typical Profile

0 to 12 inches—very dark grayish brown and dark brown gravelly silt loam
12 to 22 inches—dark brown silty clay loam
22 to 52 inches—brown clay
52 to 60 inches—strong brown silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Contrasting Inclusions

- Fernhaven and Preacher soils
- Bohannon, Digger, and McDuff soils in convex, more steeply sloping positions
- Orford soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

180E—Orford gravelly loam, 3 to 30 percent slopes

Composition

Orford soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Western Cascades Mountains
Landscape position: Ridges and side slopes
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 800 to 3,500 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, vine maple, and red huckleberry
Climatic factors:
Mean annual precipitation—55 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Typical Profile

0 to 9 inches—dark brown gravelly loam
9 to 42 inches—dark brown silty clay loam
42 to 60 inches—brown silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches
Shrink-swell potential: High

Contrasting Inclusions

- Kinney soils
- McDuff soils in convex, more steeply sloping positions
- Gustin soils in concave positions and near drainageways
- Orford soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

- Hazards of compaction and erosion
- Plant competition
- Steepness of slope
- Moderately slow permeability
- Low soil strength
- High shrink-swell potential

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes

damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

180F—Orford gravelly loam, 30 to 60 percent slopes

Composition

Orford soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Western Cascades Mountains
Landscape position: Side slopes and ridges
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 800 to 3,500 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, vine maple, and red huckleberry
Climatic factors:
Mean annual precipitation—55 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Typical Profile

0 to 9 inches—dark brown gravelly loam
9 to 42 inches—dark brown silty clay loam
42 to 60 inches—brown silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches
Shrink-swell potential: High

Contrasting Inclusions

- Kinney soils
- Klickitat and McDuff soils in convex, more steeply sloping positions
- Gustin soils in concave, less sloping positions
- Orford soils that have slopes of less than 30 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Low soil strength
- High shrink-swell potential

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

181F—Orford-Gustin complex, 30 to 60 percent slopes

Composition

Orford soil and similar inclusions—55 percent
Gustin soil and similar inclusions—30 percent
Contrasting inclusions—15 percent

Setting

Landform: Western Cascades Mountains
Landscape position: Orford—convex side slopes; Gustin—concave side slopes of less than 45 percent
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 800 to 3,500 feet
Native plants: Douglas fir and western hemlock with

an understory of salal, cascade Oregongrape, vine maple, and Oregon oxalis

Climatic factors:
Mean annual precipitation—55 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Orford Soil

Typical profile

0 to 9 inches—dark brown gravelly loam
9 to 42 inches—dark brown silty clay loam
42 to 60 inches—brown silty clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches
Shrink-swell potential: High

Gustin Soil

Typical profile

0 to 7 inches—very dark grayish brown and dark brown clay loam
7 to 24 inches—brown clay
24 to 46 inches—mottled, yellowish red clay
46 to 60 inches—mottled, grayish brown clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 12 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Kinney soils
- Klickitat and McDuff soils in convex, more steeply sloping positions
- Gustin and Orford soils that have slopes of less than 30 percent
- Orford soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Orford and Gustin

- Steepness of slope
- Hazards of erosion and compaction
- Hazard of slope failure
- Plant competition
- Low soil strength
- High shrink-swell potential

Orford

- Moderately slow permeability

Gustin

- Wetness
- Hazard of windthrow
- Slow permeability

Use and Management

Woodland

- Because the Gustin soil is unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the Gustin soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

182F—Orford-McDuff complex, 30 to 60 percent slopes

Composition

Orford soil and similar inclusions—40 percent
McDuff soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Coast Range Mountains
Landscape position: Orford—concave side slopes; McDuff—convex side slopes and ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 1,500 to 3,300 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and red huckleberry
Climatic factors:
Mean annual precipitation—55 to 90 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Orford Soil

Typical profile

0 to 12 inches—very dark grayish brown and dark brown gravelly silt loam
12 to 22 inches—dark brown silty clay loam
22 to 52 inches—brown clay
52 to 60 inches—strong brown silty clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

McDuff Soil

Typical profile

0 to 10 inches—dark brown silty clay loam
10 to 32 inches—strong brown and dark yellowish brown clay
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4 inches

Contrasting Inclusions

- Fernhaven and Preacher soils
- Bohannon and Digger soils in convex, more steeply sloping positions
- Orford and McDuff soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Orford and McDuff

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Low soil strength

McDuff

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the McDuff soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

183B—Packard gravelly loam, 0 to 5 percent slopes

Composition

Packard soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Terraces
Landscape position: Low terraces
Parent material: Mixed alluvium
Elevation: 300 to 950 feet
Native plants: Douglas fir, Oregon white oak, and bigleaf maple with an understory of common

snowberry, Pacific poison oak, and western swordfern

Climatic factors:

Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 12 inches—very dark grayish brown gravelly loam
12 to 21 inches—dark brown gravelly clay loam
21 to 32 inches—dark brown very gravelly clay loam
32 to 60 inches—reddish brown extremely gravelly clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: 6 inches

Contrasting Inclusions

- Foehlin soils
- Roseburg soils on flood plains
- Medford soils in concave positions
- Packard soils that are flooded
- Packard soils that have a cobbly surface layer

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

- High amount of rock fragments in the soil
- Hazard of compaction

Use and Management

Cropland

- Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Leveling is needed in sloping areas.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.

184A—Packard gravelly loam, flooded, 0 to 3 percent slopes

Composition

Packard soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Flood plains
Landscape position: High flood plains
Parent material: Mixed alluvium
Elevation: 300 to 950 feet
Native plants: Douglas fir, Oregon white oak, and bigleaf maple with an understory of common snowberry, Pacific poison oak, and western swordfern

Climatic factors:

Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 12 inches—very dark grayish brown gravelly loam
12 to 21 inches—dark brown gravelly clay loam
21 to 32 inches—dark brown very gravelly clay loam
32 to 60 inches—reddish brown extremely gravelly clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 6 inches
Frequency of flooding: Rare

Contrasting Inclusions

- Roseburg soils

- Foehlin soils on terraces
- Camas and Newberg soils on lower flood plains
- Packard soils that are not flooded
- Packard soils that have a cobbly surface layer

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

- Hazard of flooding
- High amount of rock fragments in the soil
- Hazard of compaction

Use and Management

Cropland

- Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Leveling is needed in sloping areas.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Structures and roads should be located above the expected flood level.

185D—Panther silty clay loam, 4 to 20 percent slopes

Composition

Panther soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Hills
Landscape position: Swales
Parent material: Residuum and colluvium derived from sandstone, siltstone, and basalt
Elevation: 300 to 2,000 feet
Native plants: Oregon white oak and Oregon ash with an understory of common snowberry, Pacific poison oak, rose, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 3 inches—very dark grayish brown silty clay loam
3 to 11 inches—black clay
11 to 34 inches—dark gray clay
34 to 63 inches—gray clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Poorly drained
Depth to water table: At the surface to a depth of 12 inches below the surface in December through April
Permeability: Very slow
Available water capacity: About 10 inches
Shrink-swell potential: High

Contrasting Inclusions

- Dupee, Sutherlin, and Veneta soils in convex, more steeply sloping positions
- Bateman, Oakland, and Windygap soils in convex, more steeply sloping positions
- Panther soils that have slopes of less than 4 percent

Major Uses

Hay and pasture, homesite development, and wetland management

Major Management Limitations

- Wetness
- Hazards of compaction and erosion
- Steepness of slope
- High shrink-swell potential
- Very slow permeability
- High clay content
- Hazard of slope failure
- Low soil strength

Use and Management

Hay and pasture

- Sprinkler and trickle irrigation systems are suited to

this unit. The method used generally is governed by the crop grown.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Select plants that can tolerate wetness.
• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Tillage and seeding should be done on the contour or across the slope where practical.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
• If a suitable outlet is available, tile drains can be used to divert subsurface water away from the absorption field.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• For the steeper areas of this unit, install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
• Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• Slumping can be minimized by restricting the construction of roads and other activities that disturb the soil to the less sloping or more well drained areas and by using properly designed road drainage systems.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

186F—Pearsoll-Dubakella complex, 30 to 70 percent south slopes

Composition

Pearsoll soil and similar inclusions—40 percent
Dubakella soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes (fig. 11)
Parent material: Colluvium and residuum derived from serpentinite and peridotite
Elevation: 700 to 3,800 feet
Native plants: Pearsoll—Jeffrey pine with an understory of wedgeleaf ceanothus, sheep fescue, pine bluegrass, iris, and western buttercup; Dubakella—Jeffrey pine, incense cedar, and scattered Douglas fir with an understory of canyon live oak, California fescue, and pine bluegrass
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—47 to 53 degrees F
Frost-free period—120 to 200 days

Pearsoll Soil

Typical profile

0 to 6 inches—dark reddish brown extremely stony clay loam
6 to 14 inches—dark reddish brown extremely cobbly clay
14 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 1.5 inches
Shrink-swell potential: High

Dubakella Soil

Typical profile

0 to 3 inches—dark reddish brown very stony clay loam

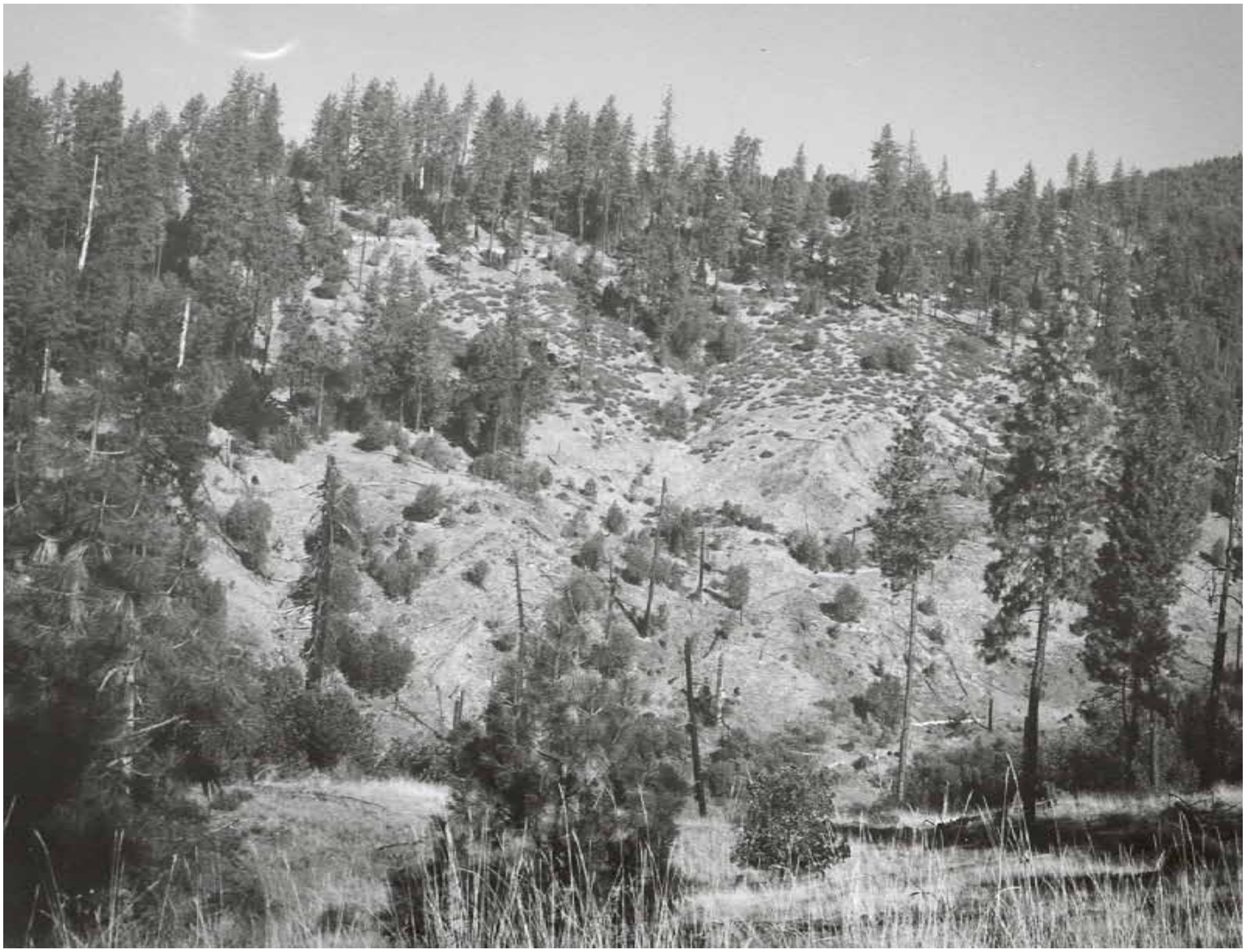


Figure 11.—Typical area of Pearsoll-Dubakella complex, 30 to 70 percent south slopes.

3 to 33 inches—dark reddish brown very cobbly clay
33 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 2.5 inches

Contrasting Inclusions

- Acker, Gravecreek, Josephine, Norling, and Speaker soils
- Peel and Eightlar soils in concave, less sloping positions
- Rock outcrop in convex, more steeply sloping positions
- Soils that are similar to the Pearsoll and Dubakella soils but have less than 35 percent rock fragments
- Soils that are similar to the Pearsoll and Dubakella soils but are less affected by the nutrient imbalance of the parent material
- Pearsoll and Dubakella soils that have slopes of less than 30 percent or more than 70 percent

Major Uses

Woodland and livestock grazing

Major Management Limitations

Pearsoll and Dubakella

- Low fertility
- Steepness of slope
- Hazards of erosion and compaction
- High amount of rock fragments on the surface and in the soil
- Seedling mortality
- Plant competition

• Slow permeability
• Depth to rock
• Hazard of windthrow

Pearsoll

• High shrink-swell potential
• Low soil strength

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Stones on the surface restrict the placement of roads and skid trails and increase the risk of breakage of timber.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

Livestock grazing

• Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
• Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
• Brush management and seeding reduce competition from woody plants and improve degraded areas.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.
• Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

187E—Peel clay loam, 3 to 30 percent slopes

Composition

Peel soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Footslopes
Parent material: Colluvium derived from serpentinite and peridotite
Elevation: 600 to 3,000 feet
Native plants: Incense cedar, Jeffrey pine, and Douglas fir with an understory of western buttercup, Gregor oniongrass, and California fescue
Climatic factors:
Mean annual precipitation—35 to 50 inches
Mean annual air temperature—50 to 54 degrees F
Frost-free period—150 to 200 days

Typical Profile

0 to 9 inches—very dark grayish brown clay loam
9 to 29 inches—dark brown and dark grayish brown gravelly clay and gravelly silty clay
29 to 38 inches—olive gray silty clay
38 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Moderately well drained
Depth to water table: 18 to 36 inches in December through March
Permeability: Slow
Available water capacity: About 4.5 inches
Shrink-swell potential: High

Contrasting Inclusions

• Eightlar soils
• Dubakella and Pearsoll soils in convex, more steeply sloping positions
• Soils that are similar to this Peel soil but are poorly drained and are in concave positions and near drainageways

- Soils that are similar to this Peel soil but have bedrock at a depth of more than 40 inches
- Peel soils that are stony
- Peel soils that have slopes of more than 30 percent

Major Uses

Pasture, woodland, and homesite development

Major Management Limitations

- Low soil fertility
- Hazards of compaction and erosion
- Wetness
- Seedling mortality
- Plant competition
- High shrink-swell potential
- Slow permeability
- Hazard of slope failure
- Hazard of windthrow
- Depth to rock
- Low soil strength

Use and Management

Pasture

- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate low soil fertility.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock or are more well drained. Onsite investigation is needed to locate these areas.
- If a suitable outlet is available, tile drains can be used to divert subsurface water away from the absorption field.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- For the steeper areas of this unit, install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
- Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
- Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
- Slumping can be minimized by restricting the construction of roads and other activities that disturb the soil to the less sloping or more well drained areas and by using properly designed road drainage systems.

• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

188D—Pengra silt loam, 2 to 20 percent slopes

Composition

Pengra soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Toeslopes, footslopes, and alluvial fans
Parent material: Alluvium and colluvium over residuum derived from sandstone and siltstone
Elevation: 400 to 2,500 feet
Native plants: Oregon white oak and Pacific madrone with an understory of Pacific poison oak, rose, blue wildrye, and California oatgrass
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 7 inches—very dark grayish brown silt loam
7 to 16 inches—very dark grayish brown silty clay loam
16 to 60 inches—dark grayish brown and olive gray clay

Soil Properties and Qualities

Depth to clay layer: 14 to 30 inches
Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: At the surface to a depth of 30 inches below the surface in November through May
Permeability: Moderately slow above the clay layer and very slow through it
Available water capacity: About 8.5 inches
Shrink-swell potential: High

Contrasting Inclusions

• Bateman and Pollard soils in convex, more steeply sloping positions
• Rosehaven and Windygap soils in convex, more steeply sloping positions
• Nonpareil, Oakland, and Speaker soils in convex, more steeply sloping positions
• Panther soils in concave positions and near drainageways
• Pengra soils that have slopes of more than 20 percent

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

• Wetness
• Hazards of compaction and erosion
• Steepness of slope
• Depth to clay layer
• High shrink-swell potential and very slow permeability of clay layer
• Hazard of slope failure
• Low soil strength

Use and Management

Cropland

• Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Select plants that can tolerate wetness.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Alternative waste disposal systems may function properly on this soil. Areas of included soils may be

suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
- If a suitable outlet is available, tile drains can be used to divert subsurface water away from the absorption field.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- For the steeper areas of this unit, install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
- Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
- Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
- Slumping can be minimized by restricting the construction of roads and other activities that disturb the soil to the less sloping or more well drained areas and by using properly designed road drainage systems.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

188E—Pengra silt loam, 20 to 30 percent slopes

Composition

Pengra soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Footslopes
Parent material: Alluvium and colluvium over residuum derived from sandstone and siltstone
Elevation: 400 to 2,500 feet
Native plants: Oregon white oak and Pacific madrone with an understory of Pacific poison oak, rose, blue wildrye, and California oatgrass
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 7 inches—very dark grayish brown silt loam
7 to 16 inches—very dark grayish brown silty clay loam
16 to 60 inches—dark grayish brown and olive gray clay

Soil Properties and Qualities

Depth to clay layer: 14 to 30 inches
Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: At the surface to a depth of 30 inches below the surface in November through May
Permeability: Moderately slow above the clay layer and very slow through it
Available water capacity: About 8.5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Bateman and Pollard soils in convex, more steeply sloping positions
- Rosehaven and Windygap soils in convex, more steeply sloping positions
- Nonpareil, Oakland, and Speaker soils in convex, more steeply sloping positions
- Panther soils in concave positions and near drainageways
- Pengra soils that have slopes of less than 20 percent

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

- Steepness of slope
- Wetness
- Hazards of erosion and compaction
- Depth to clay layer
- High shrink-swell potential and very slow permeability of clay layer
- Hazard of slope failure
- Low soil strength

Use and Management

Cropland

- Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate wetness.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
- Interceptor ditches can be used to divert subsurface water away from the absorption field.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
- Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
- Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
- Slumping can be minimized by restricting the construction of roads and other activities that disturb the soil to the less sloping or more well drained areas and by using properly designed road drainage systems.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

189E—Philomath-Dixonville complex, 3 to 30 percent slopes

Composition

Philomath soil and similar inclusions—55 percent
Dixonville soil and similar inclusions—30 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills
Landscape position: Footslopes and ridges
Parent material: Residuum and colluvium derived from basalt
Elevation: 400 to 2,000 feet
Native plants: Philomath—Oregon white oak with an understory of common snowberry, hairy honeysuckle, western buttercup, California oatgrass, and Idaho fescue; Dixonville—Douglas fir and bigleaf maple with an understory of creambush oceanspray, western hazel, common snowberry, and mountain brome
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Philomath Soil

Typical profile

0 to 4 inches—black silty clay
4 to 16 inches—black clay
16 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 12 to 20 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 2 inches
Shrink-swell potential: High

Dixonville Soil

Typical profile

0 to 8 inches—dark brown silty clay loam
8 to 31 inches—dark brown silty clay and clay
31 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Climax soils
- Curtin, Darby, and Yoncalla soils in concave positions
- Edenbower soils in convex, more steeply sloping positions

• Philomath and Dixonville soils that have slopes of more than 30 percent

Major Uses

Hay and pasture, and homesite development

Major Management Limitations

Philomath and Dixonville

- Hazards of erosion and compaction
- Steepness of slope
- Slow permeability
- High shrink-swell potential
- Depth to rock
- Low soil strength

Philomath

- Droughtiness

Use and Management

Hay and pasture

• Maintain fertility and tilth by returning crop residue to the soils and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• In areas of the Philomath soil, select plants that can tolerate droughtiness.
• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Tillage and seeding should be done on the contour or across the slope where practical.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• In many areas, it may be necessary to haul in topsoil for lawns and gardens.
• Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock. Onsite investigation is needed to locate these areas.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
• Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soils to support a load.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

189F—Philomath-Dixonville complex, 30 to 70 percent slopes

Composition

Philomath soil and similar inclusions—50 percent
Dixonville soil and similar inclusions—35 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from basalt
Elevation: 400 to 2,000 feet
Native plants: Philomath—Oregon white oak with an understory of common snowberry, hairy honeysuckle, western buttercup, California oatgrass, and Idaho fescue; Dixonville—Douglas fir and California black oak with an understory of hairy honeysuckle, tall Oregongrape, mountain sweetroot, and mountain brome
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Philomath Soil

Typical profile

0 to 4 inches—black silty clay
4 to 16 inches—black clay
16 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 12 to 20 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 2 inches
Shrink-swell potential: High

Dixonville Soil

Typical profile

0 to 8 inches—dark brown silty clay loam

8 to 31 inches—dark brown silty clay and clay
31 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Climax soils
- Darby and Yoncalla soils in concave, less sloping positions
- Edenbower soils in convex, more steeply sloping positions
- Philomath and Dixonville soils that have slopes of less than 30 percent

Major Use

Pasture

Major Management Limitations

Philomath and Dixonville

- Steepness of slope
- Hazards of erosion and compaction
- Slow permeability
- High shrink-swell potential
- Depth to rock
- Low soil strength

Philomath

- Droughtiness

Use and Management

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.
- Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

190E—Philomath-Edenbower complex, 12 to 30 percent slopes

Composition

Philomath soil and similar inclusions—55 percent
Edenbower soil and similar inclusions—30 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills
Landscape position: Ridges and convex side slopes
Parent material: Residuum and colluvium derived from basalt
Elevation: 400 to 2,000 feet
Native plants: Philomath—Oregon white oak with an understory of common snowberry, hairy honeysuckle, western buttercup, California oatgrass, and Idaho fescue; Edenbower—pine bluegrass, blue wildrye, western buttercup, and western yarrow
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—165 to 235 days

Philomath Soil

Typical profile

0 to 4 inches—black silty clay
4 to 16 inches—black clay
16 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 12 to 20 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 2 inches
Shrink-swell potential: High

Edenbower Soil

Typical profile

0 to 8 inches—very dark brown clay
8 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 4 to 10 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 1 inch
Shrink-swell potential: High

Contrasting Inclusions

- Climax and Dixonville soils
- Rock outcrop in convex, more steeply sloping positions
- Darby soils in concave positions
- Curtin and Yoncalla soils in concave positions
- Philomath and Edenbower soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Livestock grazing and homesite development

Major Management Limitations

- Depth to rock
- Steepness of slope
- Hazards of erosion and compaction
- High shrink-swell potential
- Slow permeability
- Low soil strength

Use and Management

Livestock grazing

- Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
- Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
- Brush management and seeding reduce competition from woody plants and improve degraded areas.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- In many areas, it may be necessary to haul in topsoil for lawns and gardens.
- This unit generally is not suitable for septic tank absorption fields; however, areas of suitable included soils may be in the unit. Onsite investigation is needed to locate these areas.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
- Buildings and roads should be designed to offset the limited ability of the soils to support a load.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Ripping and blasting are needed for road construction in some areas of this unit.

190F—Philomath-Edenbower complex, 30 to 60 percent slopes

Composition

Philomath soil and similar inclusions—50 percent
Edenbower soil and similar inclusions—35 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from basalt
Elevation: 400 to 2,000 feet
Native plants: Philomath—Oregon white oak with an understory of common snowberry, hairy honeysuckle, western buttercup, California oatgrass, and Idaho fescue; Edenbower—pine bluegrass, blue wildrye, western buttercup, and western yarrow
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—165 to 235 days

Philomath Soil

Typical profile

0 to 4 inches—black silty clay
4 to 16 inches—black clay
16 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 12 to 20 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 2 inches
Shrink-swell potential: High

Edenbower Soil

Typical profile

0 to 8 inches—very dark brown clay
8 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 4 to 10 inches
Drainage class: Well drained
Permeability: Slow
Available water capacity: About 1 inch
Shrink-swell potential: High

Contrasting Inclusions

- Climax and Dixonville soils
- Rock outcrop in convex positions
- Darby and Yoncalla soils in concave, less sloping positions
- Philomath and Edenbower soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Livestock grazing

Major Management Limitations

- Steepness of slope
- Depth to rock
- Hazards of erosion and compaction
- High shrink-swell potential
- Slow permeability
- Low soil strength

Use and Management

Livestock grazing

- Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
- Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
- Brush management and seeding reduce competition from woody plants and improve degraded areas.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.
- Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

191—Pits

This map unit consists of open excavations throughout the survey area from which the soil and commonly some of the underlying material, such as hard rock or gravel, have been removed. The pits in upland areas are sources of rock, and those on terraces and flood plains are sources of gravel or topsoil, or both. Many of the pits currently are being used and enlarged for the extraction of gravel, topsoil, and other fill material. This unit also consists of excavations and mine tailings from the operation of Glenbrook Nickel Company near the town of Riddle.

192E—Pollard gravelly loam, 3 to 30 percent slopes

Composition

Pollard soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Footslopes and ridges
Parent material: Residuum and colluvium derived from sandstone, siltstone, and metamorphic rock
Elevation: 800 to 3,500 feet
Native plants: Douglas fir and ponderosa pine with an understory of tall Oregongrape, common snowberry, whipplevine, and western fescue
Climatic factors:
Mean annual precipitation—35 to 50 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 200 days

Typical Profile

0 to 6 inches—dark brown gravelly loam
6 to 16 inches—yellowish red clay loam
16 to 60 inches—red clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Contrasting Inclusions

- Sutherlin, Pengra, and Veneta soils in concave positions and near drainageways
- Josephine and Speaker soils in convex, more steeply sloping positions
- Pollard soils that have slopes of more than 30 percent

Major Uses

Woodland, cropland, pasture, and homesite development

Major Management Limitations

- Hazards of compaction and erosion
- Seedling mortality
- Plant competition
- Steepness of slope
- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Cropland

• Sprinkler and trickle irrigation systems are suited to the less sloping areas of this unit. The method used generally is governed by the crop grown.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Roads should be designed to offset the limited ability of the soil to support a load.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

193F—Pollard gravelly loam, 30 to 60 percent north slopes

Composition

Pollard soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from sandstone, siltstone, and metamorphic rock
Elevation: 800 to 3,500 feet
Native plants: Douglas fir and Pacific madrone with an understory of western swordfern, common snowberry, creambush oceanspray, and western fescue
Climatic factors:
Mean annual precipitation—35 to 50 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 200 days

Typical Profile

0 to 6 inches—dark brown gravelly loam
6 to 16 inches—yellowish red clay loam
16 to 60 inches—red clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Contrasting Inclusions

- Josephine soil
- Sutherlin and Veneta soils in concave, less sloping positions
- Beekman soils in more steeply sloping positions
- Speaker soils in convex positions
- Pollard soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

194F—Pollard gravelly loam, 30 to 60 percent south slopes

Composition

Pollard soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from sandstone, siltstone, and metamorphic rock
Elevation: 800 to 3,500 feet
Native plants: Douglas fir and ponderosa pine with an understory of tall Oregongrape, whipplevine, common snowberry, and California fescue
Climatic factors:
Mean annual precipitation—35 to 50 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 200 days

Typical Profile

0 to 6 inches—dark brown gravelly loam
6 to 16 inches—yellowish red clay loam
16 to 60 inches—red clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8 inches

Contrasting Inclusions

- Josephine soil
- Sutherlin and Veneta soils in concave, less sloping positions
- Beekman soils in more steeply sloping positions
- Speaker soils in convex positions
- Pollard soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Seedling mortality
- Plant competition
- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.

• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars and culverts.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

195E—Preacher loam, 0 to 30 percent slopes

Composition

Preacher soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Broad ridges and side slopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 100 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Typical Profile

0 to 10 inches—dark brown loam
10 to 19 inches—dark brown loam
19 to 34 inches—brown loam
34 to 60 inches—brown clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 10.5 inches

Contrasting Inclusions

• Blachly, Honeygrove, Orford, and Xanadu soils
• Bohannon and Digger soils in convex, more steeply sloping positions
• Soils that are similar to this Preacher soil but have more than 35 percent rock fragments
• Soils that are similar to this Preacher soil but are poorly drained and are in concave positions and near drainageways
• Preacher soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

• Hazards of compaction and erosion
• Plant competition
• Steepness of slope

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

195F—Preacher loam, 30 to 50 percent slopes

Composition

Preacher soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes and ridges
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 100 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Typical Profile

0 to 10 inches—dark brown loam
10 to 19 inches—dark brown loam
19 to 34 inches—brown loam
34 to 60 inches—brown clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 10.5 inches

Contrasting Inclusions

- Blachly, Honeygrove, Orford, and Xanadu soils in concave, less sloping positions
- Bohannon and Digger soils in convex, more steeply sloping positions
- Soils that are similar to this Preacher soil but have more than 35 percent rock fragments
- Preacher soils that have slopes of less than 30 percent or more than 50 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

195G—Preacher loam, 50 to 75 percent slopes

Composition

Preacher soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from sandstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 100 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Typical Profile

0 to 10 inches—dark brown loam
10 to 19 inches—dark brown loam
19 to 34 inches—brown loam
34 to 60 inches—brown clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 10.5 inches

Contrasting Inclusions

- Bohannon and Digger soils in convex, more steeply sloping positions
- Soils that are similar to this Preacher soil but have more than 35 percent rock fragments
- Preacher soils that have slopes of less than 50 percent or more than 75 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Hazard of slope failure
- Plant competition

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

196E—Preacher-Blachly complex, 12 to 30 percent slopes

Composition

Preacher soil and similar inclusions—50 percent
Blachly soil and similar inclusions—35 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Broad ridges and side slopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—70 to 110 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Preacher Soil

Typical profile

0 to 10 inches—dark brown loam
10 to 19 inches—dark brown loam
19 to 34 inches—brown loam
34 to 60 inches—brown clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 10.5 inches

Blachly Soil

Typical profile

0 to 10 inches—dark reddish brown silty clay loam
10 to 21 inches—dark red clay
21 to 60 inches—red clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 7.5 inches

Contrasting Inclusions

- Bohannon and Damewood soils in convex, more steeply sloping areas
- Soils that are similar to the Blachly soil but have bedrock at a depth of less than 40 inches and are in convex, more steeply sloping positions
- Soils that are similar to the Preacher soil but have more than 35 percent rock fragments
- Soils that are similar to the Preacher and Blachly soils but are poorly drained and are in concave positions and near drainageways
- Preacher and Blachly soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Preacher and Blachly

- Hazards of compaction and erosion
- Plant competition
- Steepness of slope

Blachly

- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

197E—Preacher-Bohannon complex, 3 to 30 percent slopes

Composition

Preacher soil and similar inclusions—50 percent
Bohannon soil and similar inclusions—30 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Preacher—ridges and concave side slopes; Bohannon—ridges and convex side slopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 110 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Preacher Soil

Typical profile

0 to 10 inches—dark brown loam
10 to 19 inches—dark brown loam
19 to 34 inches—brown loam
34 to 60 inches—brown clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 10.5 inches

Bohannon Soil

Typical profile

0 to 12 inches—very dark brown and very dark grayish brown gravelly loam
12 to 32 inches—dark brown and dark yellowish brown gravelly loam
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 4 inches

Contrasting Inclusions

- Blachly, Honeygrove, Orford, and Xanadu soils
- Digger soils in convex, more steeply sloping positions
- Soils that are similar to the Preacher soil but have more than 35 percent rock fragments
- Soils that are similar to the Preacher and Bohannon soils but are poorly drained and are in concave positions and near drainageways
- Preacher and Bohannon soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Preacher and Bohannon

- Hazards of compaction and erosion
- Plant competition
- Steepness of slope

Bohannon

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Bohannon soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the Bohannon soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

197F—Preacher-Bohannon complex, 30 to 60 percent slopes

Composition

Preacher soil and similar inclusions—45 percent
Bohannon soil and similar inclusions—35 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Preacher—concave side slopes; Bohannon—convex side slopes and ridges
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 100 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Preacher Soil

Typical profile

0 to 10 inches—dark brown loam
10 to 19 inches—dark brown loam
19 to 34 inches—brown loam
34 to 60 inches—brown clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 10.5 inches

Bohannon Soil

Typical profile

0 to 12 inches—very dark brown and very dark grayish brown gravelly loam
12 to 32 inches—dark brown and dark yellowish brown gravelly loam
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 4 inches

Contrasting Inclusions

- Honeygrove, Orford, and Xanadu soils in concave, less sloping positions
- Digger soils in convex, more steeply sloping positions
- Soils that are similar to the Preacher soil but have more than 35 percent rock fragments
- Preacher and Bohannon soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Preacher and Bohannon

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition

Bohannon

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on the Bohannon soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Trees on the Bohannon soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

198F—Preacher-Bohannon-Blachly complex, 30 to 70 percent slopes

Composition

Preacher soil and similar inclusions—30 percent
Bohannon soil and similar inclusions—25 percent
Blachly soil and similar inclusions—25 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Preacher and Blachly—concave side slopes; Bohannon—convex side slopes and ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—70 to 110 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Preacher Soil

Typical profile

0 to 10 inches—dark brown loam
10 to 19 inches—dark brown loam
19 to 34 inches—brown loam
34 to 60 inches—brown clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 10.5 inches

Bohannon Soil

Typical profile

0 to 12 inches—very dark brown and very dark grayish brown gravelly loam
12 to 32 inches—dark brown and dark yellowish brown gravelly loam
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 4 inches

Blachly Soil

Typical profile

0 to 10 inches—dark reddish brown silty clay loam
10 to 21 inches—dark red clay
21 to 60 inches—red clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 7.5 inches

Contrasting Inclusions

• Digger soils in convex, more steeply sloping positions
• Soils that are similar to the Blachly soil but have bedrock at a depth of less than 40 inches and are in convex, more steeply sloping positions
• Soils that are similar to the Preacher soil but have more than 35 percent rock fragments
• Preacher, Bohannon, and Blachly soils that have slopes of less than 30 percent

• Preacher and Bohannon soils that have slopes of more than 70 percent

Major Use

Woodland

Major Management Limitations

Preacher, Bohannon, and Blachly

• Steepness of slope
• Hazards of erosion and compaction
• Plant competition

Bohannon

• Hazard of windthrow
• Depth to rock

Blachly

• Moderately slow permeability
• Low soil strength

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on the Bohannon soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Trees on the Bohannon soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

199G—Preacher-Bohannon-Digger complex, 60 to 90 percent slopes

Composition

Preacher soil and similar inclusions—40 percent
Bohannon soil and similar inclusions—25 percent
Digger soil and similar inclusions—20 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Preacher—concave side slopes; Bohannon and Digger—convex side slopes
Parent material: Colluvium derived from sandstone
Elevation: 200 to 2,200 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 100 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Preacher Soil

Typical profile

0 to 10 inches—dark brown loam
10 to 19 inches—dark brown loam
19 to 34 inches—brown loam
34 to 60 inches—brown clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 10.5 inches

Bohannon Soil

Typical profile

0 to 12 inches—very dark brown and very dark grayish brown gravelly loam
12 to 32 inches—dark brown and dark yellowish brown gravelly loam
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 4 inches

Digger Soil

Typical profile

0 to 6 inches—very dark grayish brown very gravelly loam
6 to 19 inches—dark brown very gravelly loam
19 to 28 inches—dark brown very gravelly loam
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Contrasting Inclusions

- Rock outcrop and Umpcoos soils in convex, more steeply sloping positions
- Soils that are similar to the Digger soil but have bedrock at a depth of more than 40 inches
- Preacher, Bohannon, and Digger soils that have slopes of less than 60 percent
- Bohannon and Digger soils that have slopes of more than 90 percent

Major Use

Woodland

Major Management Limitations

Preacher, Bohannon, and Digger

- Steepness of slope
- Hazard of erosion
- Hazard of slope failure
- Plant competition

Preacher

- Hazard of compaction

Bohannon

- Hazard of compaction
- Hazard of windthrow
- Depth to rock

Digger

- High amount of rock fragments on the surface and in the soil
- Seedling mortality
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
- Roadcuts on the Bohannon and Digger soils do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Bohannon and Digger soils commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

200F—Preacher-Bohannon-Xanadu complex, 30 to 60 percent slopes

Composition

Preacher soil and similar inclusions—30 percent
Bohannon soil and similar inclusions—25 percent
Xanadu soil and similar inclusions—25 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Preacher and Xanadu—concave side slopes; Bohannon—convex side slopes and ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 90 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Preacher Soil

Typical profile

0 to 10 inches—dark brown loam
10 to 19 inches—dark brown loam

19 to 34 inches—brown loam
34 to 60 inches—brown clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 10.5 inches

Bohannon Soil

Typical profile

0 to 12 inches—very dark brown and very dark grayish brown gravelly loam
12 to 32 inches—dark brown and dark yellowish brown gravelly loam
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 4 inches

Xanadu Soil

Typical profile

0 to 8 inches—dark brown gravelly loam
8 to 15 inches—dark reddish brown clay loam
15 to 60 inches—reddish brown and dark red clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9.5 inches

Contrasting Inclusions

- Digger soils in convex, more steeply sloping positions
- Soils that are similar to the Xanadu soil but have bedrock at a depth of less than 40 inches and are in convex, more steeply sloping positions
- Soils that are similar to the Preacher soil but have more than 35 percent rock fragments
- Preacher, Bohannon, and Xanadu soils that have slopes of less than 30 percent
- Preacher and Bohannon soils that have slopes of more than 70 percent

Major Use

Woodland

Major Management Limitations

Preacher, Bohannon, and Xanadu

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition

Bohannon

- Hazard of windthrow
- Depth to rock

Xanadu

- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Bohannon soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the Bohannon soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

201A—Quosatana silt loam, 0 to 3 percent slopes

Composition

Quosatana soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Flood plains
Landscape position: Swales on low flood plains
Parent material: Mixed alluvium
Elevation: 20 to 400 feet
Native plants: Oregon ash and red alder with an

understory of western swordfern, salmonberry, rushes, and sedges

Climatic factors:
Mean annual precipitation—60 to 90 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—160 to 240 days

Typical Profile

0 to 16 inches—very dark grayish brown silt loam
16 to 34 inches—dark grayish brown silt loam
34 to 55 inches—dark gray silty clay loam
55 to 63 inches—dark gray silty clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Poorly drained
Depth to water table: At the surface to a depth of 18 inches below the surface in November through April
Permeability: Slow
Available water capacity: About 12 inches
Frequency of flooding: Frequent in December through April

Contrasting Inclusions

- Wasson soils
- Kirkendall and Nekoma soils on high flood plains
- Meda soils on terraces

Major Uses

Hay and pasture, wildlife habitat, and wetland management

Major Management Limitations

- Wetness
- Hazard of flooding
- Hazard of compaction
- Slow permeability
- Low soil strength

Use and Management

Hay and pasture

- Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Reduce the risk of erosion by providing structures along streambanks to control the flow of water and by planting cover crops.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate wetness.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

202B—Redbell silt loam, 0 to 5 percent slopes

Composition

Redbell soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Terraces and alluvial fans
Landscape position: Low terraces and alluvial fans
Parent material: Mixed alluvium
Elevation: 100 to 1,200 feet
Native plants: Oregon white oak and Oregon ash with an understory of Saskatoon serviceberry, common snowberry, western swordfern, and rose
Climatic factors:
Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 8 inches—very dark grayish brown silt loam
8 to 34 inches—very dark grayish brown silty clay loam
34 to 42 inches—dark brown silty clay loam
42 to 50 inches—mottled, yellowish brown silty clay loam
50 to 62 inches—mottled, strong brown loam
62 to 70 inches—multicolored extremely gravelly sand

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 6 to 18 inches in November through May
Permeability: Moderately slow
Available water capacity: About 11 inches

Contrasting Inclusions

- Foehlin soils
- Conser soils in concave positions
- Malabon soils on higher terraces

• Sibold and Waldo soils on flood plains
• Redbell soils that have slopes of more than 5 percent

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

• Wetness
• Hazard of compaction
• Moderately slow permeability
• Low soil strength

Use and Management

Cropland

• Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Leveling is needed in sloping areas.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Select plants that can tolerate wetness.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
• If a suitable outlet is available, tile drains can be used to divert subsurface water away from the absorption field.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• Roads should be designed to offset the limited ability of the soil to support a load.

203F—Reedsport-Millicoma complex, 30 to 60 percent slopes

Composition

Reedsport soil and similar inclusions—40 percent
Millicoma soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes and narrow ridges
Parent material: Colluvium derived from sandstone
Elevation: 50 to 1,500 feet
Native plants: Douglas fir and western hemlock with an understory of salal, salmonberry, cascade Oregongrape, and vine maple
Climatic factors:
Mean annual precipitation—70 to 90 inches
Mean annual air temperature—49 to 53 degrees F
Frost-free period—145 to 240 days

Reedsport Soil

Typical profile

0 to 5 inches—very dark grayish brown gravelly loam
5 to 25 inches—dark brown loam
25 to 32 inches—dark brown clay loam
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 4 inches

Millicoma Soil

Typical profile

0 to 10 inches—very dark brown and dark brown gravelly loam
10 to 30 inches—dark yellowish brown very gravelly loam
30 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 3 inches

Contrasting Inclusions

• Salander, Svensen, and Templeton soils in concave, less sloping positions
• Soils that are similar to the Millicoma soil but have bedrock at a depth of more than 40 inches
• Rock outcrop in convex, more steeply sloping positions
• Millicoma and Reedsport soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Reedsport and Millicoma

• Steepness of slope
• Hazards of erosion and compaction
• Hazard of slope failure
• Plant competition
• Hazard of windthrow
• Depth to rock

Millicoma

• High amount of rock fragments in the soil

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on the Millicoma soil do not respond well to seeding or mulching because of the large amount of fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Headwall areas should be avoided when constructing roads.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

204G—Remote-Digger complex, 60 to 90 percent slopes

Composition

Remote soil and similar inclusions—45 percent
Digger soil and similar inclusions—35 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: North-facing side slopes
Parent material: Colluvium derived from metamorphic rock
Elevation: 1,600 to 3,600 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and red huckleberry
Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—110 to 160 days

Remote Soil

Typical profile

0 to 10 inches—dark brown very gravelly loam
10 to 26 inches—dark yellowish brown very gravelly loam
26 to 60 inches—yellowish brown and dark yellowish brown extremely gravelly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 6 inches

Digger Soil

Typical profile

0 to 6 inches—very dark grayish brown very gravelly loam

6 to 19 inches—dark brown very gravelly loam
19 to 28 inches—dark brown very gravelly loam
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Contrasting Inclusions

- Bohannon soils
- Preacher soils in concave, less sloping positions
- Umpcoos soils and Rock outcrop in convex, more steeply sloping positions
- Orford and McDuff soils in less steeply sloping positions
- Remote and Digger soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Remote and Digger

- Steepness of slope
- Hazard of erosion
- Hazard of slope failure
- High amount of rock fragments in the soil and on the surface
- Plant competition
- Seedling mortality

Digger

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soils are dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Digger soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

205E—Ritner gravelly silty clay loam, 12 to 30 percent slopes

Composition

Ritner soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Footslopes and ridges
Parent material: Colluvium derived from basalt
Elevation: 500 to 2,800 feet
Native plants: Douglas fir and Pacific madrone with an understory of whipplevine, tall Oregongrape, hairy honeysuckle, and mountain brome
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 225 days

Typical Profile

0 to 9 inches—dark reddish brown gravelly silty clay loam
9 to 23 inches—dark reddish brown very gravelly silty clay
23 to 34 inches—dark reddish brown very cobbly silty clay
34 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4.5 inches

Contrasting Inclusions

- Dixonville and Nekia soils

- Darby and Jory soils in concave positions
- Sahaptin soils in convex, more steeply sloping positions
- Yoncalla soils in concave positions
- Ritner soils that have slopes of more than 30 percent

Major Uses

Woodland, pasture, and homesite development

Major Management Limitations

- Hazards of erosion and compaction
- High amount of rock fragments in the soil
- Steepness of slope
- Plant competition
- Seedling mortality
- Moderately slow permeability
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- In many areas, it may be necessary to haul in topsoil for lawns and gardens.
- Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock. Onsite investigation is needed to locate these areas.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

206F—Ritner gravelly silty clay loam, 30 to 60 percent north slopes

Composition

Ritner soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Colluvium derived from basalt
Elevation: 500 to 2,800 feet
Native plants: Douglas fir and grand fir with an understory of salal, cascade Oregongrape, rose, and mountain brome
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 225 days

Typical Profile

0 to 9 inches—dark reddish brown gravelly silty clay loam
9 to 23 inches—dark reddish brown very gravelly silty clay
23 to 34 inches—dark reddish brown very cobbly silty clay
34 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4.5 inches

Contrasting Inclusions

- Dixonville and Nekia soils
- Darby and Jory soils in concave, less sloping positions
- Sahaptin soils in convex, more steeply sloping positions
- Yoncalla soils in concave, less sloping positions
- Ritner soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- High amount of rock fragments in the soil
- Plant competition
- Seedling mortality
- Moderately slow permeability
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

207G—Ritner gravelly silty clay loam, 60 to 90 percent north slopes

Composition

Ritner soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Colluvium derived from basalt
Elevation: 500 to 2,800 feet
Native plants: Douglas fir and grand fir with an understory of salal, cascade Oregongrape, rose, and mountain brome
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 225 days

Typical Profile

0 to 9 inches—dark reddish brown gravelly silty clay loam
9 to 23 inches—dark reddish brown very gravelly silty clay
23 to 34 inches—dark reddish brown very cobbly silty clay
34 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained

Permeability: Moderately slow
Available water capacity: About 4.5 inches

Contrasting Inclusions

- Dixonville and Nekia soils
- Darby and Jory soils in concave, less sloping positions
- Rock outcrop and Sahaptin soils in convex, more steeply sloping positions
- Ritner soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- High amount of rock fragments in the soil
- Plant competition
- Seedling mortality
- Moderately slow permeability
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

208G—Ritner-Jory complex, 60 to 90 percent slopes

Composition

Jory soil and similar inclusions—45 percent
Ritner soil and similar inclusions—40 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Ritner—convex side slopes; Jory—concave side slopes
Parent material: Colluvium derived from basalt
Elevation: 600 to 2,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, cascade Oregongrape, western swordfern, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 225 days

Ritner Soil

Typical profile

0 to 9 inches—dark reddish brown gravelly silty clay loam
9 to 23 inches—dark reddish brown very gravelly silty clay
23 to 34 inches—dark reddish brown very cobbly silty clay
34 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4.5 inches

Jory Soil

Typical profile

0 to 16 inches—dark reddish brown silty clay loam
16 to 24 inches—dark reddish brown silty clay
24 to 60 inches—dark red silty clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

- Dixonville and Nekia soils on ridges
- Sahaptin soils and Rock outcrop in convex, more steeply sloping positions
- Jory and Ritner soils that have slopes of less than 60 percent or more than 90 percent

Major Uses

Woodland, and source of quarry rock, particularly the Ritner soil

Major Management Limitations

Ritner and Jory

- Steepness of slope
- Hazards of erosion and compaction
- Hazard of slope failure
- Plant competition
- Moderately slow permeability

Ritner

- High amount of rock fragments in the soil
- Seedling mortality
- Hazard of windthrow
- Depth to rock

Jory

- Low soil strength

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
- Roadcuts on the Ritner soil do not respond well to seeding or mulching because of the large amount of fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Ritner soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

209F—Ritner-Sahaptin complex, 30 to 60 percent south slopes

Composition

Ritner soil and similar inclusions—45 percent
Sahaptin soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Colluvium derived from basalt
Elevation: 500 to 2,800 feet
Native plants: Douglas fir and Pacific madrone with an understory of whipplevine, tall Oregongrape, hairy honeysuckle, and mountain brome
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 225 days

Ritner Soil

Typical profile

0 to 9 inches—dark reddish brown gravelly silty clay loam
9 to 23 inches—dark reddish brown very gravelly silty clay
23 to 34 inches—dark reddish brown very cobbly silty clay
34 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4.5 inches

Sahaptin Soil

Typical profile

0 to 8 inches—very dark brown very cobbly silty clay loam
8 to 17 inches—dark brown extremely cobbly silty clay
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 2 inches

Contrasting Inclusions

- Dixonville and Nekia soils
- Darby and Jory soils in concave, less sloping positions
- Yoncalla soils in concave, less steeply sloping positions
- Soils that are similar to the Sahaptin soil but are less than 10 inches deep to bedrock
- Ritner and Sahaptin soils that have slopes of less than 30 percent or more than 60 percent

Major Uses

Woodland and livestock grazing

Major Management Limitations

Ritner and Sahaptin

- Steepness of slope
- Hazards of erosion and compaction
- High amount of rock fragments in the soil
- Seedling mortality
- Plant competition
- Moderately slow permeability
- Depth to rock

Sahaptin

- Hazard of windthrow
- Hazard of fire damage

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- In areas of the Sahaptin soil, increased erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees on the Sahaptin soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Livestock grazing

- Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
- Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soil and plant roots.
- Brush management and seeding reduce competition from woody plants and improve degraded areas.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.
- Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

209G—Ritner-Sahaptin complex, 60 to 90 percent south slopes

Composition

Ritner soil and similar inclusions—40 percent
Sahaptin soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Colluvium derived from basalt
Elevation: 500 to 2,800 feet
Native plants: Douglas fir and Pacific madrone with an understory of whipplevine, tall Oregongrape, hairy honeysuckle, and mountain brome
Climatic factors:
Mean annual precipitation—35 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 225 days

Ritner Soil

Typical profile

0 to 9 inches—dark reddish brown gravelly silty clay loam
9 to 23 inches—dark reddish brown very gravelly silty clay
23 to 34 inches—dark reddish brown very cobbly silty clay
34 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4.5 inches

Sahaptin Soil

Typical profile

0 to 8 inches—very dark brown very cobbly silty clay loam
8 to 17 inches—dark brown extremely cobbly silty clay
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 2 inches

Contrasting Inclusions

- Dixonville and Nekia soils
- Darby and Jory soils in concave, less sloping positions
- Rock outcrop in convex, more steeply sloping positions
- Soils that are similar to the Sahaptin soil but are less than 10 inches deep to bedrock
- Ritner and Sahaptin soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Ritner and Sahaptin

- Steepness of slope
- Hazards of erosion and compaction
- High amount of rock fragments in the soil
- Seedling mortality
- Plant competition
- Moderately slow permeability
- Depth to rock

Sahaptin

- Hazard of windthrow
- Hazard of fire damage

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted

seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• In areas of the Sahaptin soil, increased erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
• Trees on the Sahaptin soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

210—Riverwash

Composition

Riverwash and similar inclusions—90 percent
Contrasting inclusions—10 percent

Setting

Landform: Flood plains
Landscape position: Low flood plains
Parent material: Mixed alluvium
Elevation: 100 to 1,000 feet
Native plants: Occasional bunches of grass and scattered willows
Climatic factors:
Mean annual precipitation—30 to 75 inches
Mean annual air temperature—48 to 54 degrees F
Frost-free period—140 to 235 days

Riverwash

Description: Areas of highly stratified sand and gravel

Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Excessively drained to poorly drained
Depth to water table: At the surface to a depth of 24 inches below the surface in January through December
Permeability: Very rapid
Available water capacity: Variable
Frequency of flooding: Frequent in October through July

Contrasting Inclusions

• Camas and Newberg soils on higher flood plains

Major Uses

Source of sand and gravel, wildlife habitat, and recreation

Major Management Limitations

• Hazard of flooding
• Wetness
• High amount of rock fragments
• Coarse texture
• Very rapid permeability

211—Rock outcrop

Description: Areas of exposed volcanic, sedimentary, and metamorphic rock scattered throughout the survey area
Slope: 60 percent to nearly vertical
Major use: Wildlife habitat

212G—Rock outcrop-Umpcoos complex, 60 to 110 percent slopes

Composition

Rock outcrop—60 percent
Umpcoos soil and similar inclusions—25 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Side slopes and headwalls
Parent material: Colluvium derived from sandstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and Pacific madrone with an understory of cascade Oregongrape, common beargrass, whipplevine, and Alaska oniongrass
Climatic factors:
Mean annual precipitation—55 to 100 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Rock Outcrop

Description: Areas of exposed bedrock

Umpcoos Soil

Typical profile

0 to 4 inches—dark brown very gravelly sandy loam
4 to 17 inches—dark brown very gravelly sandy loam
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 1 inch

Contrasting Inclusions

- Damewood, Digger, and Bohannon soils
- Preacher soils in concave, less sloping positions
- Soils that are similar to Preacher soils but have more than 35 percent rock fragments and are in concave, less sloping positions
- Umpcoos soils that have slopes of less than 60 percent

Major Use

Woodland

Major Management Limitations

- Areas of Rock outcrop
- Steepness of slope
- Hazard of erosion
- Hazard of slope failure
- High amount of rock fragments on the surface and in the soil
- Depth to rock
- Seedling mortality
- Plant competition
- Hazard of windthrow

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- Avoiding areas with a high amount of Rock outcrop will minimize breakage of timber and increase the efficiency of yarding operations.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

213G—Romanose-Laderly complex, 60 to 90 percent south slopes

Composition

Romanose soil and similar inclusions—50 percent
Laderly soil and similar inclusions—25 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from basalt
Elevation: 1,500 to 2,850 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, trailing blackberry, and mountain brome
Climatic factors:
Mean annual precipitation—90 to 110 inches
Mean annual air temperature—42 to 45 degrees F
Frost-free period—100 to 145 days

Romanose Soil

Typical profile

0 to 12 inches—very dark brown and dark brown very gravelly sandy loam
12 to 18 inches—dark yellowish brown extremely cobbly sandy loam
18 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 2 inches

Laderly Soil

Typical profile

0 to 4 inches—very dark brown very gravelly loam
4 to 13 inches—dark brown very gravelly loam
13 to 32 inches—dark yellowish brown extremely cobbly loam
32 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 3.5 inches

Contrasting Inclusions

• Soils that are similar to the Laderly soil but have bedrock at a depth of more than 40 inches
• Soils that are similar to the Laderly soil but have less than 35 percent rock fragments
• Rock outcrop in convex, more steeply sloping positions
• Laderly and Romanose soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Romanose and Laderly

• Steepness of slope
• Hazard of erosion
• High amount of rock fragments on the surface and in the soil
• Depth to rock
• Hazard of slope failure
• Seedling mortality
• Plant competition

Romanose

• Hazard of windthrow

Use and Management

Woodland

• Highlead or other cable logging systems are best suited to this unit.
• When the soils are dry, landings can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Headwall areas should be avoided when constructing roads.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees on the Romanose soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

214A—Roseburg loam, 0 to 3 percent slopes

Composition

Roseburg soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Flood plains
Landscape position: High flood plains
Parent material: Mixed alluvium
Elevation: 100 to 950 feet
Native plants: Douglas fir and bigleaf maple with an understory of western swordfern, common snowberry, western hazel, and mountain brome
Climatic factors:
Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 10 inches—very dark grayish brown loam
10 to 15 inches—very dark grayish brown clay loam
15 to 32 inches—dark brown clay loam
32 to 41 inches—dark brown loam
41 to 64 inches—dark brown sandy loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 10 inches
Frequency of flooding: Rare

Contrasting Inclusions

• Conser, Coburg, and Sibold soils in concave positions
• Evans and Chapman soils on lower flood plains
• Foehlin, Malabon, and Medford soils on terraces

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

• Hazard of compaction
• Hazard of flooding
• Low soil strength

Use and Management

Cropland

• Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Leveling is needed in sloping areas.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Roads should be designed to offset the limited ability of the soil to support a load.
• Structures and roads should be located above the expected flood level.

215C—Rosehaven loam, 3 to 12 percent slopes

Composition

Rosehaven soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Toeslopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 12 inches—dark brown loam
12 to 25 inches—dark yellowish brown clay loam
25 to 63 inches—yellowish brown clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 11 inches

Contrasting Inclusions

• Bateman soils
• Oakland and Speaker soils in convex, more steeply sloping positions
• Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways
• Rosehaven soils that have slopes of more than 12 percent

Major Uses

Hay and pasture, woodland, and homesite development

Major Management Limitations

• Hazards of compaction and erosion
• Plant competition

Use and Management

Hay and pasture

• Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to control runoff and erosion.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

- Use conventional equipment in harvesting, but limit its use when the soil is wet.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Seed cuts and fills to permanent vegetation.

215E—Rosehaven loam, 12 to 30 percent slopes

Composition

Rosehaven soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Footslopes and broad ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 12 inches—dark brown loam
12 to 25 inches—dark yellowish brown clay loam
25 to 63 inches—yellowish brown clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 11 inches

Contrasting Inclusions

- Bateman and Kanid soils
- Oakland and Speaker soils in convex, more steeply sloping positions
- Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways
- Atring soils in convex, more steeply sloping positions
- Rosehaven soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Woodland, hay and pasture, and homesite development

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Plant competition

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

215F—Rosehaven loam, 30 to 60 percent slopes

Composition

Rosehaven soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes and ridges
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 12 inches—dark brown loam
12 to 25 inches—dark yellowish brown clay loam
25 to 63 inches—yellowish brown clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 11 inches

Contrasting Inclusions

- Bateman and Kanid soils
- Oakland and Speaker soils in convex positions
- Dupee and Sutherlin soils in concave, less sloping positions
- Larmine soils in convex, more steeply sloping positions
- Atring soils in convex, more steeply sloping positions
- Rosehaven soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

216E—Rosehaven-Atring complex, 12 to 30 percent slopes

Composition

Rosehaven soil and similar inclusions—45 percent
Atring soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Footslopes and ridges
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Rosehaven Soil

Typical profile

0 to 12 inches—dark brown loam
12 to 25 inches—dark yellowish brown clay loam
25 to 63 inches—yellowish brown clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 11 inches

Atring Soil

Typical profile

0 to 9 inches—dark grayish brown gravelly loam
9 to 20 inches—brown very gravelly loam
20 to 35 inches—yellowish brown very gravelly loam
35 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

- Bateman and Kanid soils
- Oakland and Speaker soils in convex, more steeply sloping positions
- Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways
- Rosehaven soils that have slopes of less than 12 percent
- Rosehaven and Atring soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Rosehaven and Atring

- Hazards of erosion and compaction
- Steepness of slope
- Plant competition

Atring

- High amount of rock fragments in the soil
- Seedling mortality
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Atring soil do not respond well to seeding or mulching because of the large amount of fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted

seedlings help to ensure the establishment and survival of seedlings.
• Trees on the Atring soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

216F—Rosehaven-Atring complex, 30 to 60 percent slopes

Composition

Rosehaven soil and similar inclusions—40 percent
Atring soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Rosehaven—concave side slopes; Atring—convex side slopes and ridges
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Rosehaven Soil

Typical profile

0 to 12 inches—dark brown loam
12 to 25 inches—dark yellowish brown clay loam
25 to 63 inches—yellowish brown clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 11 inches

Atring Soil

Typical profile

0 to 9 inches—dark grayish brown gravelly loam
9 to 20 inches—brown very gravelly loam
20 to 35 inches—yellowish brown very gravelly loam
35 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3 inches

Contrasting Inclusions

• Bateman and Kanid soils
• Oakland and Speaker soils in convex positions
• Dupee and Sutherlin soils in concave, less sloping positions
• Larmine soils in convex, more steeply sloping positions
• Rosehaven and Atring soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Rosehaven and Atring

• Steepness of slope
• Hazards of erosion and compaction
• Plant competition

Atring

• High amount of rock fragments in the soil
• Seedling mortality
• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on the Atring soil do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings on south- and west-

facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees on the Atring soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

217E—Salander silt loam, 12 to 30 percent slopes

Composition

Salander soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Ridges and side slopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 50 to 800 feet
Native plants: Douglas fir and Sitka spruce with an understory of salal, evergreen huckleberry, salmonberry, and Pacific rhododendron
Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—180 to 240 days

Typical Profile

0 to 17 inches—very dark brown and dark reddish brown silt loam
17 to 53 inches—dark brown silt loam
53 to 61 inches—dark brown silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 18 inches

Contrasting Inclusions

• Soils that are similar to this Salander soil but have more than 35 percent rock fragments
• Millicoma and Reedsport soils in convex, more steeply sloping positions
• Salander soils that have slopes of less than 12 percent or more than 30 percent

Major Use

Woodland

Major Management Limitations

• Hazards of erosion and compaction
• Plant competition
• Steepness of slope

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

217F—Salander silt loam, 30 to 60 percent slopes

Composition

Salander soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes and narrow ridges
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 50 to 800 feet
Native plants: Douglas fir and Sitka spruce with an understory of salal, evergreen huckleberry, salmonberry, and Pacific rhododendron
Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—180 to 240 days

Typical Profile

0 to 17 inches—very dark brown and dark reddish brown silt loam

17 to 53 inches—dark brown silt loam
53 to 61 inches—dark brown silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 18 inches

Contrasting Inclusions

- Soils that are similar to this Salander soil but have more than 35 percent rock fragments
- Millicoma and Reedsport soils in convex, more steeply sloping positions
- Salander soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

218G—Scaredman-Limpy-Rock outcrop complex, 60 to 100 percent south slopes

Composition

Scaredman soil and similar inclusions—35 percent
Limpy soil and similar inclusions—25 percent
Rock outcrop and similar inclusions—20 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Scaredman—side slopes; Limpy and Rock outcrop—side slopes and headwalls
Parent material: Colluvium derived from volcanic rock
Elevation: 3,000 to 4,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, vine maple, Pacific rhododendron, and cascade Oregongrape
Climatic factors:
Mean annual precipitation—60 to 80 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Scaredman Soil

Typical profile

0 to 10 inches—very dark grayish brown extremely gravelly loam
10 to 17 inches—dark brown very gravelly loam
17 to 29 inches—dark yellowish brown very gravelly loam
29 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 2.5 inches

Limpy Soil

Typical profile

0 to 6 inches—dark brown extremely cobbly loam
6 to 19 inches—dark brown extremely cobbly loam
19 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 12 to 20 inches
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 1.5 inches

Rock Outcrop

Description: Areas of exposed bedrock

Contrasting Inclusions

- Illahee soils
- Mellowmoon soils in concave, less sloping positions
- Scaredman and Limpy soils that have slopes of less than 60 percent

Major Use

Woodland

Major Management Limitations

Map unit

- Areas of Rock outcrop

Scaredman and Limpy

- Steepness of slope
- Hazard of erosion
- High amount of rock fragments on the surface and in the soils
- Hazard of slope failure
- Seedling mortality
- Plant competition
- Depth to rock

Limpy

- Hazard of windthrow
- Hazard of fire damage

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- Avoiding areas with a high amount of Rock outcrop will minimize breakage of timber and increase the efficiency of yarding operations.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- On the Limpy soil, an increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees on the Limpy soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

219E—Sharpshooter loam, 3 to 30 percent slopes

Composition

Sharpshooter soil and similar inclusions—90 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Ridges and side slopes
Parent material: Residuum and colluvium derived from mica schist
Elevation: 1,000 to 3,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, cascade Oregongrape, and deerfoot vanillaleaf
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Typical Profile

0 to 10 inches—dark brown loam
10 to 19 inches—dark brown loam
19 to 31 inches—dark yellowish brown loam
31 to 45 inches—dark yellowish brown gravelly loam
45 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 7.5 inches

Contrasting Inclusions

- Dumont soils
- Soils that are similar to this Sharpshooter soil but have bedrock at a depth of less than 40 inches and are in convex, more steeply sloping positions
- Zing soils in concave positions and near drainageways
- Sharpshooter soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

- Hazards of erosion and compaction
- Plant competition
- Steepness of slope
- Hazard of fire damage

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.

220F—Sharpshooter loam, 30 to 60 percent north slopes

Composition

Sharpshooter soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from mica schist
Elevation: 1,000 to 3,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, cascade Oregongrape, and deerfoot vanillaleaf
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Typical Profile

0 to 10 inches—dark brown loam
10 to 19 inches—dark brown loam
19 to 31 inches—dark yellowish brown loam
31 to 45 inches—dark yellowish brown gravelly loam
45 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 7.5 inches

Contrasting Inclusions

- Sharpshooter soils that have a clay subsoil and are in concave positions
- Atring and Kanid soils in convex, more steeply sloping positions
- Zing soils in concave, less sloping positions
- Soils that are similar to this Sharpshooter soil but are less than 40 inches deep to bedrock and are in convex, more steeply sloping positions
- Sharpshooter soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Hazard of slope failure
- Plant competition

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.

• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
• Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

220G—Sharpshooter loam, 60 to 90 percent north slopes

Composition

Sharpshooter soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from mica schist
Elevation: 1,000 to 3,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, cascade Oregongrape, and deerfoot vanillaleaf
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Typical Profile

0 to 10 inches—dark brown loam
10 to 19 inches—dark brown loam
19 to 31 inches—dark yellowish brown loam
31 to 45 inches—dark yellowish brown gravelly loam
45 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 7.5 inches

Contrasting Inclusions

• Atring and Kanid soils in convex positions
• Beal soils in concave, less sloping positions
• Soils that are similar to this Sharpshooter soil but are less than 40 inches deep to bedrock
• Sharpshooter soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

• Steepness of slope
• Hazards of erosion and compaction
• Hazard of slope failure
• Plant competition

Use and Management

Woodland

• Highlead or other cable logging systems are best suited to this unit.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
• To reduce the risk of compaction, use suitable logging systems and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
• Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
• Headwall areas should be avoided when constructing roads.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

221F—Sharpshooter loam, 30 to 60 percent south slopes

Composition

Sharpshooter soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains

Landscape position: Side slopes
Parent material: Residuum and colluvium derived from mica schist
Elevation: 1,000 to 3,000 feet
Native plants: Douglas fir and Pacific madrone with an understory of creambush oceanspray, hairy honeysuckle, whipplevine, and western fescue
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Typical Profile

0 to 10 inches—dark brown loam
10 to 19 inches—dark brown loam
19 to 31 inches—dark yellowish brown loam
31 to 45 inches—dark yellowish brown gravelly loam
45 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 7.5 inches

Contrasting Inclusions

- Sharpshooter soils that have a clay subsoil and are in concave positions
- Atring and Kanid soils in convex, more steeply sloping positions
- Zing soils in concave, less sloping positions
- Soils that are similar to this Sharpshooter soil but are less than 40 inches deep to bedrock and are in convex, more steeply sloping positions
- Sharpshooter soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Hazard of slope failure
- Seedling mortality
- Plant competition
- Hazard of fire damage

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.

221G—Sharpshooter loam, 60 to 90 percent south slopes

Composition

Sharpshooter soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from mica schist
Elevation: 1,000 to 3,000 feet
Native plants: Douglas fir and Pacific madrone with an understory of creambush oceanspray, hairy honeysuckle, whipplevine, and western fescue
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Typical Profile

0 to 10 inches—dark brown loam
10 to 19 inches—dark brown loam
19 to 31 inches—dark yellowish brown loam
31 to 45 inches—dark yellowish brown gravelly loam
45 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 7.5 inches

Contrasting Inclusions

- Atring and Kanid soils in convex positions
- Beal soils in concave, less sloping positions
- Soils that are similar to this Sharpshooter soil but are less than 40 inches deep to bedrock
- Sharpshooter soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Hazard of slope failure
- Seedling mortality
- Plant competition
- Hazard of fire damage

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
- Headwall areas should be avoided when constructing roads.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.

222F—Shivigny-Honeygrove complex, 30 to 60 percent north slopes

Composition

Shivigny soil and similar inclusions—45 percent
Honeygrove soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Shivigny—convex side slopes; Honeygrove—concave side slopes
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 800 to 3,200 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, and vine maple
Climatic factors:
Mean annual precipitation—55 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Shivigny Soil

Typical profile

0 to 10 inches—dark reddish brown very gravelly loam
10 to 21 inches—yellowish red very stony clay loam
21 to 64 inches—yellowish red very stony clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained

Permeability: Moderately slow
Available water capacity: About 6 inches

Honeygrove Soil

Typical profile

0 to 12 inches—dark reddish brown gravelly clay loam
12 to 30 inches—dark reddish brown clay
30 to 63 inches—dark red clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Contrasting Inclusions

- Kinney soils
- Gustin soils in concave, less sloping positions
- Klickitat and Peavine soils in convex, more steeply sloping positions
- Honeygrove and Shivigny soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Shivigny and Honeygrove

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Low soil strength

Shivigny

- High amount of rock fragments on the surface and in the soil

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Shivigny soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

222G—Shivigny-Honeygrove complex, 60 to 90 percent north slopes

Composition

Shivigny soil and similar inclusions—45 percent
Honeygrove soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Shivigny—convex side slopes; Honeygrove—concave side slopes of less than 75 percent
Parent material: Colluvium derived from volcanic rock
Elevation: 800 to 3,200 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, and vine maple
Climatic factors:
Mean annual precipitation—55 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Shivigny Soil

Typical profile

0 to 10 inches—dark reddish brown very gravelly loam
10 to 21 inches—yellowish red very stony clay loam
21 to 64 inches—yellowish red very stony clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 6 inches

Honeygrove Soil

Typical profile

0 to 12 inches—dark reddish brown gravelly clay loam
12 to 30 inches—dark reddish brown clay
30 to 63 inches—dark red clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Contrasting Inclusions

- Peavine soils in convex, more steeply sloping positions
- Soils that are similar to the Shivigny soil but are less than 40 inches deep to bedrock and are in convex, more steeply sloping positions
- Honeygrove and Shivigny soils that have slopes of less than 60 percent
- Shivigny soils that have slopes of more than 90 percent

Major Use

Woodland

Major Management Limitations

Shivigny and Honeygrove

- Steepness of slope
- Hazards of erosion and compaction
- Hazard of slope failure
- Plant competition
- Moderately slow permeability
- Low soil strength

Shivigny

- High amount of rock fragments on the surface and in the soil

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
- Roadcuts on the Shivigny soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

223F—Shivigny-Honeygrove complex, 30 to 60 percent south slopes

Composition

Shivigny soil and similar inclusions—45 percent
Honeygrove soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Shivigny—convex side slopes; Honeygrove—concave side slopes
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 800 to 3,200 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, and vine maple
Climatic factors:
Mean annual precipitation—55 to 75 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 160 days

Shivigny Soil

Typical profile

0 to 10 inches—dark reddish brown very gravelly loam
10 to 21 inches—yellowish red very stony clay loam
21 to 64 inches—yellowish red very stony clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 6 inches

Honeygrove Soil

Typical profile

0 to 12 inches—dark reddish brown gravelly clay loam

12 to 30 inches—dark reddish brown clay
30 to 63 inches—dark red clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9 inches

Contrasting Inclusions

- Kinney soils
- Gustin soils in concave, less sloping positions
- Klickitat and Peavine soils in convex, more steeply sloping positions
- Honeygrove and Shivigny soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Shivigny and Honeygrove

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Low soil strength

Shivigny

- High amount of rock fragments on the surface and in the soil
- Seedling mortality

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Shivigny soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

224B—Sibold fine sandy loam, 0 to 5 percent slopes

Composition

Sibold soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Flood plains
Landscape position: High flood plains
Parent material: Mixed alluvium
Elevation: 100 to 2,000 feet
Native plants: Oregon white oak and Oregon ash with an understory of Pacific poison oak, common snowberry, rose, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 6 inches—dark brown fine sandy loam
6 to 12 inches—dark brown loam
12 to 40 inches—dark yellowish brown loam
40 to 49 inches—yellowish brown loam
49 to 63 inches—brownish yellow silty clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 6 to 18 inches in November through May
Permeability: Moderately slow above the silty clay layer and very slow through it
Available water capacity: About 10 inches
Frequency of flooding: Rare
Shrink-swell potential: High in the clay layer

Contrasting Inclusions

- Roseburg soils
- Chapman, Chehalis, Evans, and Newberg soils on lower flood plains

• Conser soils in concave positions
• Soils that are similar to this Sibold but are poorly drained and are in concave positions
• Banning, Foehlin, and Redbell soils on terraces

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

• Wetness
• Hazard of compaction
• Hazard of flooding
• Very slow permeability
• Low soil strength

Use and Management

Cropland

• Furrow, border, corrugation, trickle, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Leveling is needed in sloping areas.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Select plants that can tolerate wetness.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
• If a suitable outlet is available, tile drains can be used to divert subsurface water away from the absorption field.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• Roads should be designed to offset the limited ability of the soil to support a load.
• Structures and roads should be located above the expected flood level.

225D—Speaker loam, 2 to 20 percent slopes

Composition

Speaker soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Ridges and footslopes
Parent material: Colluvium and residuum derived from sandstone, siltstone, and metamorphic rock
Elevation: 400 to 2,500 feet
Native plants: Douglas fir and ponderosa pine with an understory of tall Oregongrape, whipplevine, common snowberry, and California fescue
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 10 inches—dark brown loam
10 to 25 inches—dark brown loam
25 to 31 inches—strong brown gravelly clay loam
31 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5 inches

Contrasting Inclusions

• Josephine, Oakland, Pollard, and Rosehaven soils
• Beekman, Dickerson, and Nonpareil soils in convex positions
• Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways

• Speaker soils that have slopes of more than 20 percent

Major Uses

Hay and pasture, woodland, and homesite development

Major Management Limitations

• Hazards of compaction and erosion
• Steepness of slope
• Plant competition
• Seedling mortality
• Moderately slow permeability
• Hazard of windthrow
• Depth to rock

Use and Management

Hay and pasture

• Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to control runoff and erosion.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Tillage and seeding should be done on the contour or across the slope where practical.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

• Use conventional equipment in harvesting, but limit its use when the soil is wet.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock. Onsite investigation is needed to locate these areas.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

225E—Speaker loam, 20 to 30 percent slopes

Composition

Speaker soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes and ridges
Parent material: Colluvium and residuum derived from sandstone, siltstone, and metamorphic rock
Elevation: 400 to 2,500 feet
Native plants: Douglas fir and ponderosa pine with an understory of tall Oregongrape, whipplevine, common snowberry, and California fescue
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 10 inches—dark brown loam
10 to 25 inches—dark brown loam

25 to 31 inches—strong brown gravelly clay loam
31 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5 inches

Contrasting Inclusions

- Josephine, Oakland, Pollard, and Rosehaven soils
- Beekman, Dickerson, and Nonpareil soils in convex positions
- Dupee, Pengra, Sutherlin, and Veneta soils in concave positions and near drainageways
- Speaker soils that have slopes of less than 20 percent or more than 30 percent

Major Uses

Hay and pasture, woodland, and homesite development

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Seedling mortality
- Plant competition
- Moderately slow permeability
- Hazard of windthrow
- Depth to rock

Use and Management

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock. Onsite investigation is needed to locate these areas.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

226F—Speaker loam, 30 to 60 percent north slopes

Composition

Speaker soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes

Parent material: Colluvium and residuum derived from sandstone, siltstone, and metamorphic rock
Elevation: 400 to 2,500 feet
Native plants: Douglas fir and Pacific madrone with an understory of western swordfern, creambush oceanspray, western hazel, and mountain brome
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 10 inches—dark brown loam
10 to 25 inches—dark brown loam
25 to 31 inches—strong brown gravelly clay loam
31 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5 inches

Contrasting Inclusions

- Josephine, Oakland, Pollard, and Rosehaven soils
- Beekman, Dickerson, and Nonpareil soils in convex positions
- Dupee, Pengra, Sutherlin, and Veneta soils in concave positions and near drainageways
- Speaker soils that have slopes of less than 30 percent or more than 60 percent

Major Uses

Pasture and woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Hazard of windthrow
- Depth to rock

Use and Management

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.
- Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

227F—Speaker loam, 30 to 60 percent south slopes

Composition

Speaker soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from sandstone, siltstone, and metamorphic rock
Elevation: 400 to 2,500 feet
Native plants: Douglas fir and ponderosa pine with an understory of tall Oregongrape, whipplevine, common snowberry, and California fescue
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 10 inches—dark brown loam
10 to 25 inches—dark brown loam
25 to 31 inches—strong brown gravelly clay loam
31 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5 inches

Contrasting Inclusions

• Josephine, Oakland, Pollard, and Rosehaven soils
• Beekman, Dickerson, and Nonpareil soils in convex positions
• Dupee, Pengra, Sutherlin, and Veneta soils in concave positions and near drainageways
• Speaker soils that have slopes of less than 30 percent or more than 60 percent

Major Uses

Pasture and woodland

Major Management Limitations

• Steepness of slope
• Hazards of erosion and compaction
• Seedling mortality
• Plant competition
• Moderately slow permeability
• Hazard of windthrow
• Depth to rock

Use and Management

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.
• Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

228G—Speaker-Beekman-Josephine complex, 60 to 90 percent north slopes

Composition

Speaker soil and similar inclusions—30 percent
Beekman soil and similar inclusions—25 percent
Josephine soil and similar inclusions—20 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Speaker—convex side slopes of less than 75 percent; Beekman—convex side slopes; Josephine—concave side slopes of less than 75 percent
Parent material: Colluvium derived from sandstone
Elevation: 600 to 2,100 feet
Native plants: Douglas fir and incense cedar with an understory of western swordfern, creambush oceanspray, and whipplevine
Climatic factors:
Mean annual precipitation—35 to 45 inches
Mean annual air temperature—49 to 54 degrees F
Frost-free period—140 to 200 days

Speaker Soil

Typical profile

0 to 10 inches—dark brown loam
10 to 25 inches—dark brown loam
25 to 31 inches—strong brown gravelly clay loam
31 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained

Permeability: Moderately slow
Available water capacity: About 5 inches

Beekman Soil

Typical profile

0 to 5 inches—brown gravelly loam
5 to 18 inches—dark yellowish brown very gravelly loam
18 to 26 inches—dark yellowish brown very gravelly clay loam
26 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: 3 inches

Josephine Soil

Typical profile

0 to 5 inches—dark brown gravelly loam
5 to 22 inches—yellowish red gravelly loam
22 to 59 inches—yellowish red gravelly clay loam
59 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 7 inches

Contrasting Inclusions

- Nonpareil and Vermisa soils and Rock outcrop in convex, more steeply sloping positions
- Josephine and Speaker soils that have slopes of less than 60 percent
- Speaker and Beekman soils that have slopes of more than 90 percent

Major Use

Woodland

Major Management Limitations

Speaker, Beekman, and Josephine

- Steepness of slope
- Hazard of erosion
- Hazard of slope failure
- Plant competition

Speaker

- Hazard of compaction
- Moderately slow permeability
- Hazard of windthrow
- Depth to rock

Beekman

- High amount of rock fragments on the surface and in the soil
- Seedling mortality
- Hazard of windthrow
- Depth to rock

Josephine

- Hazard of compaction
- Moderately slow permeability

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Speaker and Beekman soils commonly are subject to windthrow during periods

when the soils are excessively wet and winds are strong.

229G—Speaker-Beekman-Nonpareil complex, 60 to 90 percent south slopes

Composition

Speaker soil and similar inclusions—50 percent
Beekman soil and similar inclusions—20 percent
Josephine soil and similar inclusions—15 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills
Landscape position: Speaker—side slopes of less than 75 percent; Beekman and Nonpareil—side slopes
Parent material: Colluvium derived from sandstone
Elevation: 600 to 2,100 feet
Native plants: Speaker and Beekman—Douglas fir and incense cedar with an understory of western swordfern, creambush oceanspray, and whipplevine; Nonpareil—Oregon white oak and Pacific madrone with an understory of Pacific poison oak, hairy honeysuckle, Saskatoon serviceberry, and blue wildrye
Climatic factors:
Mean annual precipitation—35 to 45 inches
Mean annual air temperature—49 to 54 degrees F
Frost-free period—140 to 200 days

Speaker Soil

Typical profile

0 to 10 inches—dark brown loam
10 to 25 inches—dark brown loam
25 to 31 inches—strong brown gravelly clay loam
31 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5 inches

Beekman Soil

Typical profile

0 to 5 inches—brown gravelly loam
5 to 18 inches—dark yellowish brown very gravelly loam
18 to 26 inches—dark yellowish brown very gravelly clay loam
26 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 3 inches

Nonpareil Soil

Typical profile

0 to 4 inches—brown loam
4 to 17 inches—brown and dark yellowish brown loam
17 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2.5 inches

Contrasting Inclusions

- Vermisa soils and Rock outcrop in convex, more steeply sloping positions
- Josephine soils in concave, less sloping positions
- Speaker soil that have slopes of less than 60 percent
- Beekman and Nonpareil soils that have slopes of more than 90 percent

Major Use

Woodland

Major Management Limitations

Speaker, Beekman, and Nonpareil

- Steepness of slope
- Hazard of erosion
- Hazard of slope failure
- Seedling mortality
- Plant competition
- Hazard of windthrow
- Depth to rock

Speaker

- Hazard of compaction
- Moderately slow permeability

Beekman

- High amount of rock fragments on the surface and in the soil

Nonpareil

- Hazard of compaction
- Droughtiness
- Low soil strength

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

230E—Speaker-Nonpareil complex, 3 to 30 percent slopes

Composition

Speaker soil and similar inclusions—50 percent
Nonpareil soil and similar inclusions—35 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills
Landscape position: Side slopes and ridges
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 400 to 2,500 feet
Native plants: Speaker—Douglas fir and ponderosa pine with an understory of tall Oregongrape, whipplevine, common snowberry, and California fescue; Nonpareil—Oregon white oak and Pacific madrone with an understory of Pacific poison oak, hairy honeysuckle, Saskatoon serviceberry, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Speaker Soil

Typical profile

0 to 10 inches—dark brown loam
10 to 25 inches—dark brown loam
25 to 31 inches—strong brown gravelly clay loam
31 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5 inches

Nonpareil Soil

Typical profile

0 to 4 inches—brown loam
4 to 17 inches—brown and dark yellowish brown loam
17 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2.5 inches

Contrasting Inclusions

- Josephine, Oakland, Pollard, and Rosehaven soils
- Beekman soils in convex, more steeply sloping positions
- Dupee, Pengra, Sutherlin, and Veneta soils in concave positions and near drainageways
- Speaker and Nonpareil soils that have slopes of more than 30 percent

Major Uses

Hay and pasture, homesite development, and woodland

Major Management Limitations

Speaker and Nonpareil

- Hazards of erosion and compaction
- Steepness of slope
- Hazard of windthrow
- Depth to rock

Speaker

- Seedling mortality
- Plant competition
- Moderately slow permeability

Nonpareil

- Droughtiness
- Low soil strength

Use and Management

Hay and pasture

- Sprinkler and trickle irrigation systems are suited to the less sloping areas of this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Maintain fertility and tilth by returning crop residue to the soils and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- In many areas, it may be necessary to haul in topsoil for lawns and gardens.
- Septic tank absorption fields can be installed in some areas of this unit that are deeper to bedrock. Onsite investigation is needed to locate these areas.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

230F—Speaker-Nonpareil complex, 30 to 60 percent slopes

Composition

Speaker soil and similar inclusions—45 percent
Nonpareil soil and similar inclusions—40 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills

Landscape position: Side slopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Elevation: 400 to 2,500 feet
Native plants: Speaker—Douglas fir and ponderosa pine with an understory of tall Oregongrape, whipplevine, common snowberry, and California fescue; Nonpareil—Oregon white oak and Pacific madrone with an understory of Pacific poison oak, hairy honeysuckle, Saskatoon serviceberry, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Speaker Soil

Typical profile

0 to 10 inches—dark brown loam
10 to 25 inches—dark brown loam
25 to 31 inches—strong brown gravelly clay loam
31 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5 inches

Nonpareil Soil

Typical profile

0 to 4 inches—brown loam
4 to 17 inches—brown and dark yellowish brown loam
17 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2.5 inches

Contrasting Inclusions

- Josephine, Oakland, Pollard, and Rosehaven soils
- Beekman soils in convex, more steeply sloping positions
- Dupee, Pengra, Sutherlin, and Veneta soils in concave positions and near drainageways
- Speaker and Nonpareil soils that have slopes of less than 30 percent or more than 60 percent

Major Uses

Pasture and woodland

Major Management Limitations

Speaker and Nonpareil

- Steepness of slope
- Hazards of erosion and compaction
- Hazard of windthrow
- Depth to rock

Speaker

- Seedling mortality
- Plant competition
- Moderately slow permeability

Nonpareil

- Droughtiness
- Low soil strength

Use and Management

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.
- Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings. On the west- and south-facing slopes, leave some of the larger trees to provide shade.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.

• Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

231G—Stackyards extremely gravelly loam, 60 to 90 percent north slopes

Composition

Stackyards soil and similar inclusions—90 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from metamorphic rock
Elevation: 3,000 to 4,000 feet
Native plants: Douglas fir and golden chinkapin with an understory of salal, cascade Oregongrape, Pacific rhododendron, and western swordfern
Climatic factors:
Mean annual precipitation—85 to 90 inches
Mean annual air temperature—42 to 45 degrees F
Frost-free period—50 to 100 days

Typical Profile

0 to 10 inches—very dark grayish brown extremely gravelly loam
10 to 15 inches—dark brown extremely cobbly clay loam
15 to 44 inches—dark yellowish brown extremely cobbly loam and extremely cobbly clay loam
44 inches—hard bedrock

Soil Properties and Qualities

Depth to hard bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5 inches

Contrasting Inclusions

• Rock outcrop
• Soils that are similar to this Stackyards soil but have bedrock at a depth of less than 40 inches

Major Use

Woodland

Major Management Limitations

• Steepness of slope
• Hazard of erosion
• High amount of rock fragments on the surface and in the soil
• Hazard of slope failure
• Plant competition
• Seedling mortality

Use and Management

Woodland

• Highlead or other cable logging systems are best suited to this unit.
• When the soil is dry, landings can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
• Headwall areas should be avoided when constructing roads.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

232G—Steinmetz-Sitkum complex, 60 to 90 percent north slopes

Composition

Steinmetz soil and similar inclusions—45 percent
Sitkum soil and similar inclusions—35 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Steinmetz—concave side slopes; Sitkum—convex side slopes
Parent material: Colluvium derived from granodiorite

Elevation: 1,000 to 3,300 feet
Native plants: Douglas fir and grand fir with an understory of salal, cascade Oregongrape, whipplevine, and creambush oceanspray
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 180 days

Steinmetz Soil

Typical profile

0 to 5 inches—dark brown gravelly sandy loam
5 to 15 inches—dark brown sandy loam
15 to 60 inches—strong brown sandy loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 6 inches

Sitkum Soil

Typical profile

0 to 4 inches—dark brown sandy loam
4 to 38 inches—strong brown sandy loam
38 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Contrasting Inclusions

- Sharpshooter soils
- Lettia soils in concave, less sloping positions
- Rock outcrop in convex, more steeply sloping positions
- Soils that are similar to the Sitkum soil but have more than 35 percent rock fragments and are in convex, more steeply sloping positions
- Steinmetz and Sitkum soils that have a very gravelly or very cobbly surface layer
- Steinmetz soils that have slopes of less than 60 percent
- Sitkum soils that have slopes of more than 90 percent

Major Use

Woodland

Major Management Limitations

Steinmetz and Sitkum

- Steepness of slope
- Hazard of erosion
- Hazard of slope failure
- Plant competition
- Seedling mortality
- Hazard of fire damage

Sitkum

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soils are dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees on the Sitkum soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

233G—Steinmetz-Sitkum complex, 60 to 90 percent south slopes

Composition

Steinmetz soil and similar inclusions—45 percent
Sitkum soil and similar inclusions—35 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Steinmetz—concave side slopes; Sitkum—convex side slopes
Parent material: Colluvium derived from granodiorite
Elevation: 1,000 to 3,300 feet
Native plants: Douglas fir and Pacific madrone with an understory of creambush oceanspray, whipplevine, tall Oregongrape, and western fescue
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 180 days

Steinmetz Soil

Typical profile

0 to 5 inches—dark brown gravelly sandy loam
5 to 15 inches—dark brown sandy loam
15 to 60 inches—strong brown sandy loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 6 inches

Sitkum Soil

Typical profile

0 to 4 inches—dark brown sandy loam
4 to 38 inches—strong brown sandy loam
38 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Contrasting Inclusions

- Sharpshooter soils
- Lettia soils in concave, less sloping positions
- Rock outcrop in convex, more steeply sloping positions
- Soils that are similar to the Sitkum soil but have more than 35 percent rock fragments and are in convex, more steeply sloping positions
- Steinmetz and Sitkum soils that have a very gravelly or very cobbly surface layer
- Steinmetz soils that have slopes of less than 60 percent
- Sitkum soils that have slopes of more than 90 percent

Major Use

Woodland

Major Management Limitations

Steinmetz and Sitkum

- Steepness of slope
- Hazard of erosion
- Hazard of slope failure
- Seedling mortality
- Plant competition
- Hazard of fire damage

Sitkum

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soils are dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
- Headwall areas should be avoided when constructing roads.
- Leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted

seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
• Trees on the Sitkum soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

234C—Stockel fine sandy loam, 3 to 12 percent slopes

Composition

Stockel soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills
Landscape position: Toeslopes and alluvial fans
Parent material: Mixed alluvium and colluvium derived from sandstone and siltstone
Elevation: 400 to 1,500 feet
Native plants: Oregon white oak and Oregon ash with an understory of Pacific poison oak, common snowberry, rose, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 9 inches—dark brown fine sandy loam
9 to 23 inches—dark brown and dark yellowish brown loam
23 to 43 inches—dark yellowish brown gravelly loam and gravelly sandy loam
43 to 63 inches—mottled, grayish brown clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 12 to 24 inches in November through April
Permeability: Moderate above the clay layer and very slow through it
Available water capacity: About 9 inches
Shrink-swell potential: High in the clay layer

Contrasting Inclusions

• Foehlin and Malabon soils
• Dupee, Pengra, Sutherlin, and Veneta soils
• Panther soils near drainageways
• Bateman, Oakland, Rosehaven, and Windygap silt loams in convex, more steeply sloping positions
• Stockel soils that have slopes of more than 12 percent

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

• Wetness
• Hazards of compaction and erosion

Use and Management

Cropland

• Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Select plants that can tolerate wetness.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.

- If a suitable outlet is available, tile drains can be used to divert subsurface water away from the absorption field.
- Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
- Seed cuts and fills to permanent vegetation.

235C—Sutherlin silt loam, 3 to 12 percent slopes

Composition

Sutherlin soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Toeslopes and alluvial fans
Parent material: Alluvium and colluvium over residuum derived from sandstone and siltstone
Elevation: 300 to 2,000 feet
Native plants: Oregon white oak, Pacific madrone, and Douglas fir with an understory of Pacific poison oak, Saskatoon serviceberry, western buttercup, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 16 inches—dark brown and dark yellowish brown silt loam
16 to 30 inches—dark yellowish brown silty clay loam
30 to 43 inches—mottled, dark yellowish brown and yellowish brown silty clay
43 to 60 inches—mottled, yellowish brown and light brownish gray silty clay

Soil Properties and Qualities

Depth to clay layer: 24 to 36 inches
Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 18 to 36 inches in November through April
Permeability: Moderately slow above the clay layer and very slow through it
Available water capacity: About 10 inches
Shrink-swell potential: High

Contrasting Inclusions

- Dupee, Pengra, and Veneta soils
- Bateman, Pollard, Rosehaven, and Windygap silt loams in convex positions
- Nonpareil soils in convex, more steeply sloping positions
- Oakland and Speaker soils in convex positions
- Panther soils in concave positions and near drainageways
- Sutherlin soils that have slopes of more than 12 percent

Major Uses

Cropland, pasture, woodland, and homesite development

Major Management Limitations

- Wetness
- Hazards of compaction and erosion
- Depth to clay layer
- High shrink-swell potential and very slow permeability of clay layer
- Low soil strength
- Plant competition
- Seedling mortality
- Hazard of windthrow

Use and Management

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

- Because the soil is unsuited to traffic when wet, use equipment only during dry periods.

• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Avoiding very wet areas, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Septic tank absorption fields can be installed in some areas of this unit that are deeper to the clay layer. Onsite investigation is needed to locate these areas.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
• Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• Seed cuts and fills to permanent vegetation.

235D—Sutherlin silt loam, 12 to 20 percent slopes

Composition

Sutherlin soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Footslopes and alluvial fans
Parent material: Alluvium and colluvium over residuum derived from sandstone and siltstone
Elevation: 300 to 2,000 feet
Native plants: Oregon white oak, Pacific madrone, and Douglas fir with an understory of Pacific poison oak, Saskatoon serviceberry, western buttercup, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 16 inches—dark brown and dark yellowish brown silt loam
16 to 30 inches—dark yellowish brown silty clay loam
30 to 43 inches—mottled, dark yellowish brown and yellowish brown silty clay
43 to 60 inches—mottled, yellowish brown and light brownish gray silty clay

Soil Properties and Qualities

Depth to clay layer: 24 to 36 inches
Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 18 to 36 inches in November through April
Permeability: Moderately slow above the clay layer and very slow through it
Available water capacity: About 10 inches
Shrink-swell potential: High

Contrasting Inclusions

• Dupee, Pengra, and Veneta soils
• Bateman, Pollard, Rosehaven, and Windygap silt loams in convex positions
• Nonpareil soils in convex, more steeply sloping positions
• Oakland and Speaker soils in convex positions
• Panther soils in concave positions and near drainageways
• Sutherlin soils that have slopes of less than 12 percent or more than 20 percent

Major Uses

Cropland, pasture, woodland, and homesite development

Major Management Limitations

- Wetness
- Hazards of erosion and compaction
- Steepness of slope
- Depth to clay layer
- High shrink-swell potential and very slow permeability of clay layer
- Hazard of slope failure
- Low soil strength
- Plant competition
- Seedling mortality
- Hazard of windthrow

Use and Management

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

- Because the soil is unsuited to traffic when wet, use equipment only during dry periods.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Avoiding very wet areas, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Septic tank absorption fields can be installed in some areas of this unit that are deeper to the clay layer. Onsite investigation is needed to locate these areas.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
- Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.

• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• Slumping can be minimized by restricting the construction of roads and other activities that disturb the soil to the less sloping or more well drained areas and by using properly designed road drainage systems.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

235E—Sutherlin silt loam, 20 to 30 percent slopes

Composition

Sutherlin soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Footslopes and side slopes
Parent material: Alluvium and colluvium over residuum derived from sandstone and siltstone
Elevation: 300 to 2,000 feet
Native plants: Oregon white oak, Pacific madrone, and Douglas fir with an understory of Pacific poison oak, Saskatoon serviceberry, western buttercup, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 16 inches—dark brown and dark yellowish brown silt loam
16 to 30 inches—dark yellowish brown silty clay loam
30 to 43 inches—mottled, dark yellowish brown and yellowish brown silty clay
43 to 60 inches—mottled, yellowish brown and light brownish gray silty clay

Soil Properties and Qualities

Depth to clay layer: 24 to 36 inches
Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 18 to 36 inches in November through April
Permeability: Moderately slow above the clay layer and very slow through it
Available water capacity: About 10 inches
Shrink-swell potential: High

Contrasting Inclusions

• Dupee, Pengra, and Veneta soils
• Bateman, Pollard, Rosehaven, and Windygap silt loams in convex positions
• Nonpareil soils in convex, more steeply sloping positions
• Oakland and Speaker soils in convex positions
• Panther soils in concave positions and near drainageways
• Sutherlin soils that have slopes of less than 20 percent or more than 30 percent

Major Uses

Cropland, pasture, woodland, and homesite development

Major Management Limitations

• Steepness of slope
• Wetness
• Hazards of erosion and compaction
• Depth to clay layer
• High shrink-swell potential and very slow permeability of clay layer
• Hazard of slope failure (fig. 12)
• Low soil strength
• Plant competition
• Seedling mortality
• Hazard of windthrow

Use and Management

Cropland

• Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

• Because the soil is unsuited to traffic when wet, use equipment only during dry periods.
• Wheeled and tracked equipment can be used, but

Figure 12.—Landslide in an area of Sutherlin silt loam, 20 to 30 percent slopes.

cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
• Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Avoiding very wet areas, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.

• Septic tank absorption fields can be installed in areas of this unit that are deeper to the clay layer. Onsite investigation is needed to locate these areas.
• Interceptor ditches can be used to divert subsurface water away from the absorption field.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
• Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• Slumping can be minimized by restricting the construction of roads and other activities that disturb the soil to the less sloping or more well drained areas and by using properly designed road drainage systems.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

235F—Sutherlin silt loam, 30 to 50 percent slopes

Composition

Sutherlin soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Alluvium and colluvium over residuum derived from sandstone and siltstone
Elevation: 300 to 2,000 feet
Native plants: Oregon white oak, Pacific madrone, and Douglas fir with an understory of Pacific poison oak, Saskatoon serviceberry, western buttercup, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 16 inches—dark brown and dark yellowish brown silt loam
16 to 30 inches—dark yellowish brown silty clay loam
30 to 43 inches—mottled, dark yellowish brown and yellowish brown silty clay
43 to 60 inches—mottled, yellowish brown and light brownish gray silty clay

Soil Properties and Qualities

Depth to clay layer: 24 to 36 inches
Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 18 to 36 inches in November through April
Permeability: Moderately slow above the clay layer and very slow through it
Available water capacity: About 10 inches
Shrink-swell potential: High

Contrasting Inclusions

• Bateman, Pollard, Rosehaven, and Windygap silt loams in convex positions
• Dupee, Pengra, and Veneta soils in concave, less sloping positions
• Nonpareil soils in convex, more steeply sloping positions
• Oakland and Speaker soils in convex positions
• Sutherlin soils that have slopes of less than 30 percent

Major Uses

Pasture and woodland

Major Management Limitations

• Steepness of slope
• Hazards of erosion and compaction
• Hazard of slope failure
• Wetness
• Depth to clay layer
• High shrink-swell potential and very slow permeability of clay layer
• Low soil strength
• Plant competition
• Seedling mortality
• Hazard of windthrow

Use and Management

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.
• Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

Woodland

- Because the soil is unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Avoiding very wet areas, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

236C—Sutherlin-Oakland complex, 3 to 12 percent slopes

Composition

Sutherlin soil and similar inclusions—45 percent
Oakland soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Sutherlin—concave toeslopes; Oakland—convex toeslopes
Parent material: Sutherlin—alluvium and colluvium over residuum derived from sandstone and siltstone; Oakland—residuum and colluvium derived from sandstone and siltstone
Elevation: 300 to 2,000 feet
Native plants: Oregon white oak and Pacific madrone with an understory of Pacific poison oak, common snowberry, Saskatoon serviceberry, and blue wildrye
Climatic factors:
Mean annual precipitation—35 to 50 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Sutherlin Soil

Typical profile

0 to 16 inches—dark brown and dark yellowish brown silt loam
16 to 30 inches—dark yellowish brown silty clay loam
30 to 43 inches—mottled, dark yellowish brown and yellowish brown silty clay
43 to 60 inches—mottled, yellowish brown and light brownish gray silty clay

Properties and qualities

Depth to clay layer: 24 to 36 inches
Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 18 to 36 inches in November through April
Permeability: Moderately slow above the clay layer and very slow through it
Available water capacity: About 10 inches
Shrink-swell potential: High

Oakland Soil

Typical profile

0 to 5 inches—dark brown silt loam
5 to 20 inches—dark yellowish brown silty clay loam
20 to 24 inches—dark yellowish brown silty clay
24 to 28 inches—dark brown gravelly silty clay
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Contrasting Inclusions

- Dupee, Pengra, and Veneta soils
- Bateman, Pollard, Rosehaven, and Windygap silt loams in convex positions
- Nonpareil soils in convex, more steeply sloping positions
- Speaker soils in convex positions

• Panther soils in concave positions and near drainageways
• Oakland and Sutherlin soils that have slopes of more than 12 percent

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

Sutherlin and Oakland

• Hazards of compaction and erosion
• Low soil strength
• Plant competition

Sutherlin

• Wetness
• Depth to clay layer
• High shrink-swell potential and very slow permeability of clay layer
• Seedling mortality

Oakland

• Moderately slow permeability
• Depth to rock

Use and Management

Cropland

• Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Septic tank absorption fields can be installed in some areas of this unit that are deeper to the clay layer or to bedrock. Onsite investigation is needed to locate these areas.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Roads should be designed to offset the effects of shrinking and swelling in the Sutherlin soil and the limited ability of the soils to support a load.
• On the Sutherlin soil, prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
• Reduce wetness in the Sutherlin soil by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• Seed cuts and fills to permanent vegetation.

237E—Svensen loam, 3 to 30 percent slopes

Composition

Svensen soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Ridges and side slopes
Parent material: Colluvium and residuum derived from sandstone
Elevation: 50 to 1,100 feet
Native plants: Douglas fir and Sitka spruce with an understory of salal, evergreen huckleberry, salmonberry, and Pacific rhododendron
Climatic factors:
Mean annual precipitation—70 to 90 inches
Mean annual air temperature—49 to 53 degrees F
Frost-free period—145 to 240 days

Typical Profile

0 to 12 inches—very dark brown and very dark grayish brown loam
12 to 29 inches—dark brown loam
29 to 41 inches—dark brown clay loam
41 to 52 inches—dark yellowish brown loam
52 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained

Permeability: Moderately rapid
Available water capacity: About 8 inches

Contrasting Inclusions

- Soils that are similar to this Svensen soil but have more than 35 percent rock fragments and are in convex, more steeply sloping positions
- Millicoma and Reedsport soils in convex, more steeply sloping positions
- Svensen soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

- Hazards of compaction and erosion
- Plant competition
- Steepness of slope

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

237F—Svensen loam, 30 to 60 percent slopes

Composition

Svensen soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes and narrow ridges
Parent material: Colluvium and residuum derived from sandstone
Elevation: 50 to 1,100 feet
Native plants: Douglas fir and Sitka spruce with an understory of salal, evergreen huckleberry, salmonberry, and Pacific rhododendron
Climatic factors:
Mean annual precipitation—70 to 90 inches
Mean annual air temperature—49 to 53 degrees F
Frost-free period—145 to 240 days

Typical Profile

0 to 12 inches—very dark brown and very dark grayish brown loam
12 to 29 inches—dark brown loam
29 to 41 inches—dark brown clay loam
41 to 52 inches—dark yellowish brown loam
52 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 8 inches

Contrasting Inclusions

- Soils that are similar to this Svensen soil but have more than 35 percent rock fragments and are in convex, more steeply sloping positions
- Millicoma and Reedsport soils in convex, more steeply sloping positions
- Svensen soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and

harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

238F—Svensen-Millicoma-Reedsport complex, 35 to 75 percent slopes

Composition

Svensen soil and similar inclusions—40 percent
Millicoma soil and similar inclusions—30 percent
Reedsport soil and similar inclusions—20 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Svensen—concave side slopes; Millicoma and Reedsport—convex side slopes and narrow ridges
Parent material: Colluvium derived from sandstone
Elevation: 50 to 1,100 feet
Native plants: Douglas fir and western hemlock with an understory of salal, salmonberry, cascade Oregongrape, and vine maple
Climatic factors:
Mean annual precipitation—70 to 90 inches
Mean annual air temperature—49 to 53 degrees F
Frost-free period—145 to 240 days

Svensen Soil

Typical profile

0 to 12 inches—very dark brown and very dark grayish brown loam
12 to 29 inches—dark brown loam
29 to 41 inches—dark brown clay loam
41 to 52 inches—dark yellowish brown loam
52 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 8 inches

Millicoma Soil

Typical profile

0 to 10 inches—very dark brown and dark brown gravelly loam
10 to 30 inches—dark yellowish brown very gravelly loam
30 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 3 inches

Reedsport Soil

0 to 5 inches—very dark grayish brown gravelly loam
5 to 25 inches—dark brown loam
25 to 32 inches—dark brown clay loam
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 4 inches

Contrasting Inclusions

• Soils that are similar to the Millicoma soil but have bedrock at a depth of more than 40 inches
• Svensen, Millicoma, and Reedsport soils that have slopes of less than 35 percent or more than 75 percent

Major Use

Woodland

Major Management Limitations

Svensen, Millicoma, and Reedsport

- Steepness of slope
- Hazards of erosion and compaction
- Hazard of slope failure
- Plant competition

Millicoma

- High amount of rock fragments in the soil
- Hazard of windthrow
- Depth to rock

Reedsport

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.

• Roadcuts on the Millicoma soil do not respond well to seeding or mulching because of the large amount of fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
• Headwall areas should be avoided when constructing roads.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Trees on the Millicoma and Reedsport soils commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

239E—Sweetbriar silty clay loam, 3 to 30 percent slopes

Composition

Sweetbriar soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Ridges and side slopes
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 1,000 to 3,000 feet
Native plants: Douglas fir and Pacific madrone with an understory of creambush oceanspray, whipplevine, common snowberry, and western fescue
Climatic factors:
Mean annual precipitation—45 to 55 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 160 days

Typical Profile

0 to 8 inches—very dark grayish brown silty clay loam
8 to 18 inches—dark brown clay
18 to 38 inches—dark yellowish brown clay
38 to 60 inches—yellowish brown and dark yellowish brown silty clay loam and clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

• Zing soils in concave positions and near drainageways
• Soils that are similar to this Sweetbriar soil but have more than 35 percent rock fragments or have bedrock at a depth of less than 40 inches and are in convex, more steeply sloping positions
• Sweetbriar soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

• Hazards of compaction and erosion
• Plant competition
• Steepness of slope
• Moderately slow permeability
• High shrink-swell potential
• Low soil strength

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

240F—Sweetbriar silty clay loam, 30 to 60 percent north slopes

Composition

Sweetbriar soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 1,000 to 3,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, cascade Oregongrape, and western swordfern
Climatic factors:
Mean annual precipitation—45 to 55 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 160 days

Typical Profile

0 to 8 inches—very dark grayish brown silty clay loam
8 to 18 inches—dark brown clay
18 to 38 inches—dark yellowish brown clay
38 to 60 inches—yellowish brown and dark yellowish brown silty clay loam and clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

• Zing soils in concave, less sloping positions
• Soils that are similar to this Sweetbriar soil but have more than 35 percent rock fragments or have bedrock at a depth of less than 40 inches and are in convex, more steeply sloping positions
• Rock outcrop in convex, more steeply sloping positions
• Sweetbriar soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

• Steepness of slope
• Hazards of erosion and compaction
• Plant competition
• Moderately slow permeability
• High shrink-swell potential
• Low soil strength

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

241F—Sweetbriar silty clay loam, 30 to 60 percent south slopes

Composition

Sweetbriar soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 1,000 to 3,000 feet
Native plants: Douglas fir and Pacific madrone with an understory of creambush oceanspray, whipplevine, common snowberry, and western fescue
Climatic factors:
Mean annual precipitation—45 to 55 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 160 days

Typical Profile

0 to 8 inches—very dark grayish brown silty clay loam
8 to 18 inches—dark brown clay

18 to 38 inches—dark yellowish brown clay
38 to 60 inches—yellowish brown and dark yellowish brown silty clay loam and clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Zing soils in concave, less sloping positions
- Soils that are similar to this Sweetbriar soil but have more than 35 percent rock fragments or have bedrock at a depth of less than 40 inches and are in convex, more steeply sloping positions
- Rock outcrop in convex, more steeply sloping positions
- Sweetbriar soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- High shrink-swell potential
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

242F—Templeton-Millicoma complex, 30 to 50 percent slopes

Composition

Templeton soil and similar inclusions—45 percent
Millicoma soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Templeton—concave side slopes; Millicoma—convex side slopes and narrow ridges
Parent material: Colluvium derived from sandstone and siltstone
Elevation: 50 to 700 feet
Native plants: Douglas fir and western hemlock with an understory of salal, salmonberry, cascade Oregongrape, and vine maple
Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—180 to 240 days

Templeton Soil

Typical profile

0 to 11 inches—dark brown silt loam
11 to 20 inches—dark yellowish brown silt loam
20 to 60 inches—dark yellowish brown silty clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 14 inches

Millicoma Soil

Typical profile

0 to 10 inches—very dark brown and dark brown gravelly loam
10 to 30 inches—dark yellowish brown very gravelly loam
30 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 3 inches

Contrasting Inclusions

- Reedsport soils
- Soils that are similar to the Millicoma soil but have bedrock at a depth of more than 40 inches
- Templeton and Millicoma soils that have slopes of less than 30 percent or more than 50 percent

Major Use

Woodland

Major Management Limitations

Templeton and Millicoma

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition

Millicoma

- High amount of rock fragments on the surface and in the soil
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Millicoma soil do not respond well to seeding or mulching because of the large amount of fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the Millicoma soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

242G—Templeton-Millicoma complex, 50 to 75 percent slopes

Composition

Templeton soil and similar inclusions—40 percent
Millicoma soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Templeton—concave side slopes; Millicoma—convex side slopes
Parent material: Colluvium derived from sandstone
Elevation: 50 to 700 feet
Native plants: Douglas fir and western hemlock with an understory of salal, salmonberry, cascade Oregongrape, and vine maple
Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—180 to 240 days

Templeton Soil

Typical profile

0 to 11 inches—dark brown silt loam
11 to 20 inches—dark yellowish brown silt loam
20 to 60 inches—dark yellowish brown silty clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 14 inches

Millicoma Soil

Typical profile

0 to 10 inches—very dark brown and dark brown gravelly loam
10 to 30 inches—dark yellowish brown very gravelly loam
30 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 3 inches

Contrasting Inclusions

- Reedsport soils

- Soils that are similar to the Millicoma soil but have bedrock at a depth of more than 40 inches
- Templeton and Millicoma soils that have slopes of less than 50 percent or more than 70 percent

Major Use

Woodland

Major Management Limitations

Templeton and Millicoma

- Steepness of slope
- Hazards of erosion and compaction
- Hazard of slope failure
- Plant competition

Millicoma

- High amount of rock fragments on the surface and in the soil
- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on the Millicoma soil do not respond well to seeding or mulching because of the large amount of fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Trees on the Millicoma soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

243G—Tethrick-Siskiyou complex, 60 to 90 percent north slopes

Composition

Tethrick soil and similar inclusions—45 percent
Siskiyou soil and similar inclusions—35 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Tethrick—concave side slopes; Siskiyou—convex side slopes
Parent material: Colluvium derived from granodiorite
Elevation: 700 to 2,200 feet
Native plants: Douglas fir and incense cedar with an understory of creambush oceanspray, cascade Oregongrape, common snowberry, and western fescue
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—49 to 53 degrees F
Frost-free period—150 to 200 days

Tethrick Soil

Typical profile

0 to 5 inches—dark brown sandy loam
5 to 46 inches—yellowish brown sandy loam
46 to 60 inches—light yellowish brown sandy loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5.5 inches

Siskiyou Soil

Typical profile

0 to 4 inches—dark brown sandy loam
4 to 32 inches—brown and dark yellowish brown sandy loam
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 2.5 inches

Contrasting Inclusions

- Wolfpeak soils in concave, less sloping positions
- Soils that are similar to the Tethrick and Siskiyou

soils but have more than 35 percent rock fragments, have a gravelly or cobbly surface layer, and are in convex, more steeply sloping positions
• Tethrick soils that have slopes of less than 60 percent
• Siskiyou soils that have slopes of more than 90 percent

Major Use

Woodland

Major Management Limitations

Tethrick and Siskiyou

• Steepness of slope
• Hazard of erosion
• Hazard of slope failure
• Plant competition
• Seedling mortality
• Hazard of fire damage

Siskiyou

• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Highlead or other cable logging systems are best suited to this unit.
• When the soils are dry, landings can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
• Headwall areas should be avoided when constructing roads.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
• Trees on the Siskiyou soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

244G—Tethrick-Siskiyou complex, 60 to 90 percent south slopes

Composition

Tethrick soil and similar inclusions—45 percent
Siskiyou soil and similar inclusions—35 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Tethrick—concave side slopes; Siskiyou—convex side slopes
Parent material: Colluvium derived from granodiorite
Elevation: 700 to 2,200 feet
Native plants: Douglas fir and sugar pine with an understory of Pacific poison oak, tall Oregongrape, whipplevine, and California fescue
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—49 to 53 degrees F
Frost-free period—150 to 200 days

Tethrick Soil

Typical profile

0 to 5 inches—dark brown sandy loam
5 to 46 inches—yellowish brown sandy loam
46 to 60 inches—light yellowish brown sandy loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 5.5 inches

Siskiyou Soil

Typical profile

0 to 4 inches—dark brown sandy loam
4 to 32 inches—brown and dark yellowish brown sandy loam
32 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 2.5 inches

Contrasting Inclusions

- Wolfpeak soils in concave, less sloping positions
- Soils that are similar to the Tethrick and Siskiyou soils but have more than 35 percent rock fragments, have a gravelly or cobbly surface layer, and are in convex, more steeply sloping positions
- Tethrick soils that have slopes of less than 60 percent
- Siskiyou soils that have slopes of more than 90 percent

Major Use

Woodland

Major Management Limitations

Tethrick and Siskiyou

- Steepness of slope
- Hazard of erosion
- Hazard of slope failure
- Seedling mortality
- Plant competition
- Hazard of fire damage

Siskiyou

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soils are dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
- Headwall areas should be avoided when constructing roads.
- Leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees on the Siskiyou soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

245E—Thistleburn clay loam, 3 to 30 percent slopes

Composition

Thistleburn soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes and broad ridges
Parent material: Residuum and colluvium derived from volcanic tuff
Elevation: 3,000 to 4,400 feet
Native plants: Douglas fir and western hemlock with an understory of salal, vine maple, Pacific rhododendron, and cascade Oregongrape
Climatic factors:
Mean annual precipitation—55 to 70 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Typical Profile

0 to 10 inches—very dark gray clay loam
10 to 40 inches—dark yellowish brown clay
40 to 49 inches—yellowish brown clay
49 to 70 inches—strong brown silty clay and silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained

Permeability: Moderately slow
Available water capacity: About 10 inches
Shrink-swell potential: High

Contrasting Inclusions

• Illahee soils in convex, more steeply sloping positions
• Soils that are similar to this Thistleburn soil but have more than 35 percent rock fragments and are in convex, more steeply sloping positions
• Telemon soils in concave positions and near drainageways
• Thistleburn soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

• Hazards of compaction and erosion
• Plant competition
• Steepness of slope
• Moderately slow permeability
• High shrink-swell potential
• Low soil strength

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Air drainage may be restricted on this unit; therefore, timber harvesting methods should be designed to reduce the effect of frost on regeneration.

246E—Thistleburn-Illahee-Telemon complex, 3 to 30 percent slopes

Composition

Thistleburn soil and similar inclusions—35 percent
Illahee soil and similar inclusions—30 percent
Telemon soil and similar inclusions—20 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Thistleburn and Illahee—convex side slopes and ridges; Telemon—swales and concave side slopes
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 3,000 to 4,400 feet
Native plants: Douglas fir and western hemlock with an understory of salal, vine maple, Pacific rhododendron, and cascade Oregongrape
Climatic factors:
Mean annual precipitation—60 to 70 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Thistleburn Soil

Typical profile

0 to 10 inches—very dark gray clay loam
10 to 40 inches—dark yellowish brown clay
40 to 49 inches—yellowish brown clay
49 to 70 inches—strong brown silty clay and silty clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10 inches
Shrink-swell potential: High

Illahee Soil

Typical profile

0 to 10 inches—black very gravelly loam
10 to 47 inches—very dark brown to dark brown very gravelly loam
47 to 60 inches—dark yellowish brown very cobbly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained

Permeability: Moderately rapid
Available water capacity: About 6 inches

Telemon Soil

Typical profile

0 to 8 inches—dark reddish brown gravelly clay loam
8 to 12 inches—dark reddish brown clay
12 to 37 inches—pale olive and light olive brown clay
37 to 60 inches—pale olive and olive yellow clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Permeability: Slow
Available water capacity: About 10 inches
Depth to water table: 12 to 36 inches in November through May
Shrink-swell potential: High

Contrasting Inclusions

- Soils that are similar to the Thistleburn soil but have more than 35 percent rock fragments and are in convex, more steeply sloping positions
- Thistleburn, Illahee, and Telemon soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Thistleburn, Illahee, and Telemon

- Hazard of erosion
- Plant competition
- Hazard of slope failure
- Steepness of slope

Thistleburn

- Hazard of compaction
- Moderately slow permeability
- High shrink-swell potential
- Low soil strength

Illahee

- High amount of rock fragments on the surface and in the soil
- Seedling mortality

Telemon

- Wetness
- Hazard of compaction
- Seedling mortality
- Slow permeability
- High shrink-swell potential
- Low soil strength
- Hazard of windthrow

Use and Management

Woodland

- Because the Telemon soil is unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Illahee soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Avoiding very wet areas, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Air drainage may be restricted on this unit; therefore, timber harvesting methods should be designed to reduce the effect of frost on regeneration.
- Trees on the Telemon soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

246F—Thistleburn-Illahee-Telemon complex, 30 to 60 percent slopes

Composition

Thistleburn soil and similar inclusions—35 percent

Illahee soil and similar inclusions—35 percent
Telemon soil and similar inclusions—15 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Thistleburn and Illahee—convex side slopes; Telemon—concave side slopes
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 3,000 to 4,400 feet
Native plants: Douglas fir and western hemlock with an understory of salal, vine maple, Pacific rhododendron, and cascade Oregongrape
Climatic factors:
Mean annual precipitation—60 to 70 inches
Mean annual air temperature—40 to 45 degrees F
Frost-free period—50 to 100 days

Thistleburn Soil

Typical profile

0 to 10 inches—very dark gray clay loam
10 to 40 inches—dark yellowish brown clay
40 to 49 inches—yellowish brown clay
49 to 70 inches—strong brown silty clay and silty clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10 inches
Shrink-swell potential: High

Illahee Soil

Typical profile

0 to 10 inches—black very gravelly loam
10 to 47 inches—very dark brown to dark brown very gravelly loam
47 to 60 inches—dark yellowish brown very cobbly loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 6 inches

Telemon Soil

Typical profile

0 to 8 inches—dark reddish brown gravelly clay loam
8 to 12 inches—dark reddish brown clay
12 to 37 inches—pale olive and light olive brown clay
37 to 60 inches—pale olive and olive yellow clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Permeability: Slow
Available water capacity: About 10 inches
Depth to water table: 12 to 36 inches in November through May
Shrink-swell potential: High

Contrasting Inclusions

- Scaredman soils in convex, more steeply sloping positions
- Soils that are similar to the Thistleburn soil but have more than 35 percent rock fragments and are in convex, more steeply sloping positions
- Thistleburn, Illahee, and Telemon soils that have slopes of less than 30 percent
- Thistleburn and Illahee soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Thistleburn, Illahee, and Telemon

- Steepness of slope
- Hazard of erosion
- Plant competition
- Hazard of slope failure

Thistleburn

- Hazard of compaction
- Moderately slow permeability
- High shrink-swell potential
- Low soil strength

Illahee

- High amount of rock fragments on the surface and in the soil
- Seedling mortality

Telemon

- Wetness
- Hazard of compaction
- Seedling mortality
- Slow permeability
- High shrink-swell potential
- Low soil strength
- Hazard of windthrow

Use and Management

Woodland

• Because the Telemon soil is unsuited to traffic when wet, use equipment only during dry periods.
• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Roadcuts on the Illahee soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Avoiding very wet areas, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees on the Telemon soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

247F—Threeforks loam, 30 to 60 percent north slopes

Composition

Threeforks soil and similar inclusions—90 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from mica schist
Elevation: 1,800 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, Pacific rhododendron, cascade Oregongrape, and red huckleberry
Climatic factors:
Mean annual precipitation—50 to 60 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 170 days

Typical Profile

0 to 11 inches—very dark grayish brown loam
11 to 33 inches—very dark grayish brown and dark brown loam
33 to 49 inches—dark brown gravelly clay loam
49 to 60 inches—dark brown very gravelly clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 8.5 inches

Contrasting Inclusions

• Atring and Kanid soils in convex, more steeply sloping positions
• Zing soils in concave, less sloping positions
• Soils that are similar to this Threeforks soil but are less than 40 inches deep to bedrock and are in convex, more steeply sloping positions
• Threeforks soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

• Hazards of erosion and compaction
• Steepness of slope
• Hazard of slope failure
• Plant competition

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.

• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
• Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

247G—Threeforks loam, 60 to 90 percent north slopes

Composition

Threeforks soil and similar inclusions—90 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from mica schist
Elevation: 1,800 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, Pacific rhododendron, cascade Oregongrape, and red huckleberry
Climatic factors:
Mean annual precipitation—45 to 60 inches
Mean annual air temperature—46 to 52 degrees F
Frost-free period—100 to 170 days

Typical Profile

0 to 11 inches—very dark grayish brown loam
11 to 33 inches—very dark grayish brown and dark brown loam
33 to 49 inches—dark brown gravelly clay loam
49 to 60 inches—dark brown very gravelly clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 8.5 inches

Contrasting Inclusions

• Atring and Kanid soils in convex, more steeply sloping positions
• Beal soils in concave, less sloping positions
• Soils that are similar to this Threeforks soil but are less than 40 inches deep to bedrock
• Threeforks soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

• Steepness of slope
• Hazards of erosion and compaction
• Hazard of slope failure
• Plant competition

Use and Management

Woodland

• Highlead or other cable logging systems are best suited to this unit.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
• To reduce the risk of compaction, use suitable logging systems and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
• Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
• Headwall areas should be avoided when constructing roads.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce

competition from undesirable understory plants and helps to retain moisture in summer.

248G—Threeforks loam, 60 to 90 percent south slopes

Composition

Threeforks soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Colluvium derived from mica schist
Elevation: 1,800 to 3,000 feet
Native plants: Douglas fir and grand fir with an understory of salal, whipplevine, cascade Oregongrape, and western swordfern
Climatic factors:
Mean annual precipitation—50 to 60 inches
Mean annual air temperature—45 to 50 degrees F
Frost-free period—100 to 170 days

Typical Profile

0 to 11 inches—very dark grayish brown loam
11 to 33 inches—very dark grayish brown and dark brown loam
33 to 49 inches—dark brown gravelly clay loam
49 to 60 inches—dark brown very gravelly clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 8.5 inches

Contrasting Inclusions

- Atring and Kanid soils in convex, more steeply sloping positions
- Beal soils in concave, less sloping positions
- Soils that are similar to this Threeforks soil but are less than 40 inches deep to bedrock
- Threeforks soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Hazard of slope failure
- Plant competition
- Seedling mortality
- Hazard of fire damage

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- To reduce the risk of compaction, use suitable logging systems and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.

249E—Tishar-Jory complex, 3 to 30 percent slopes

Composition

Tishar soil and similar inclusions—50 percent
Jory soil and similar inclusions—40 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Slump blocks
Parent material: Colluvium derived from basalt
Elevation: 1,600 to 2,650 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 50 inches
Mean annual air temperature—50 to 54 degrees F
Frost-free period—160 to 220 days

Tishar Soil

Typical profile

0 to 13 inches—dark brown gravelly silty clay loam
13 to 22 inches—yellowish red very gravelly silty clay
22 to 52 inches—yellowish red very gravelly clay
52 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Jory Soil

Typical profile

0 to 16 inches—dark reddish brown silty clay loam
16 to 24 inches—dark reddish brown silty clay
24 to 60 inches—dark red silty clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

- Yoncalla soils in concave positions and near drainageways
- Ritner soils in convex, more steeply sloping positions
- Tishar and Jory soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Tishar and Jory

- Hazard of erosion and compaction
- Plant competition
- Moderately slow permeability
- Steepness of slope

Tishar

- High amount of rock fragments on the surface and in the soil
- Seedling mortality

Jory

- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Tishar soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

249F—Tishar-Jory complex, 30 to 60 percent slopes

Composition

Tishar soil and similar inclusions—55 percent
Jory soil and similar inclusions—35 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Slump blocks
Parent material: Colluvium derived from basalt
Elevation: 1,600 to 2,650 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 50 inches
Mean annual air temperature—50 to 54 degrees F
Frost-free period—160 to 220 days

Tishar Soil

Typical profile

0 to 13 inches—dark brown gravelly silty clay loam
13 to 22 inches—yellowish red very gravelly silty clay
22 to 52 inches—yellowish red very gravelly clay
52 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

Jory Soil

Typical profile

0 to 16 inches—dark reddish brown silty clay loam
16 to 24 inches—dark reddish brown silty clay
24 to 60 inches—dark red silty clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

- Yoncalla soils in concave, less sloping positions
- Ritner soils in convex, more steeply sloping positions
- Tishar and Jory soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Tishar and Jory

- Steepness of slope
- Hazard of erosion and compaction
- Plant competition
- Moderately slow permeability

Tishar

- High amount of rock fragments on the surface and in the soil
- Seedling mortality

Jory

- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on the Tishar soil do not respond well to seeding or mulching because of the large amount of exposed rock fragments.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.

250E—Tishar-McGinnis complex, 3 to 30 percent slopes

Composition

Tishar soil and similar inclusions—40 percent
McGinnis soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Ridges and side slopes
Parent material: Colluvium and residuum derived from sandstone, siltstone, and metamorphic rock
Elevation: 600 to 3,200 feet
Native plants: Douglas fir and Pacific madrone with an understory of salal, cascade Oregongrape, western swordfern, and mountain brome
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—47 to 54 degrees F
Frost-free period—120 to 220 days

Tishar Soil

Typical profile

0 to 13 inches—dark brown gravelly silty clay loam
13 to 22 inches—yellowish red very gravelly silty clay
22 to 52 inches—yellowish red very gravelly clay
52 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

McGinnis Soil

Typical profile

0 to 4 inches—dark brown very gravelly clay loam
4 to 10 inches—dark brown gravelly clay loam
10 to 28 inches—reddish brown very gravelly silty clay
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 3 inches

Contrasting Inclusions

- Acker and Norling soils
- Atring soils in convex, more steeply sloping positions
- Dumont soils in concave positions
- Zing soils in concave positions and near drainageways
- Tishar and McGinnis soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Tishar and McGinnis

- Hazard of erosion and compaction
- High amount of rock fragments on the surface and in the soils
- Plant competition
- Seedling mortality
- Steepness of slope
- Moderately slow permeability

McGinnis

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the McGinnis soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

251F—Tishar-McGinnis complex, 30 to 60 percent north slopes

Composition

Tishar soil and similar inclusions—40 percent
McGinnis soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Tishar—concave side slopes; McGinnis—convex side slopes
Parent material: Colluvium and residuum derived from sandstone, siltstone, and metamorphic rock
Elevation: 600 to 3,200 feet
Native plants: Douglas fir and Pacific madrone with an understory of salal, cascade Oregongrape, western swordfern, and mountain brome
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—47 to 54 degrees F
Frost-free period—120 to 220 days

Tishar Soil

Typical profile

0 to 13 inches—dark brown gravelly silty clay loam
13 to 22 inches—yellowish red very gravelly silty clay
22 to 52 inches—yellowish red very gravelly clay
52 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

McGinnis Soil

Typical profile

0 to 4 inches—dark brown very gravelly clay loam
4 to 10 inches—dark brown gravelly clay loam
10 to 28 inches—reddish brown very gravelly silty clay
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 3 inches

Contrasting Inclusions

- Acker and Norling soils
- Atring and Vermisa soils in convex, more steeply sloping positions
- Dumont and Zing soils in concave, less sloping positions
- Tishar and McGinnis soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Tishar and McGinnis

- Steepness of slope
- Hazards of erosion and compaction
- High amount of rock fragments on the surface and in the soil
- Plant competition
- Seedling mortality
- Moderately slow permeability

McGinnis

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted

seedlings help to ensure the establishment and survival of seedlings.
• Trees on the McGinnis soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

251G—Tishar-McGinnis complex, 60 to 80 percent north slopes

Composition

Tishar soil and similar inclusions—40 percent
McGinnis soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Tishar—concave side slopes; McGinnis—convex side slopes
Parent material: Colluvium derived from sandstone, siltstone, and metamorphic rock
Elevation: 600 to 3,200 feet
Native plants: Douglas fir and Pacific madrone with an understory of salal, cascade Oregongrape, western swordfern, and mountain brome
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—47 to 54 degrees F
Frost-free period—120 to 220 days

Tishar Soil

Typical profile

0 to 13 inches—dark brown gravelly silty clay loam
13 to 22 inches—yellowish red very gravelly silty clay
22 to 52 inches—yellowish red very gravelly clay
52 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

McGinnis Soil

Typical profile

0 to 4 inches—dark brown very gravelly clay loam
4 to 10 inches—dark brown gravelly clay loam
10 to 28 inches—reddish brown very gravelly silty clay
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 3 inches

Contrasting Inclusions

• Acker and Norling soils
• Atring, Kanid, and Vermisa soils and Rock outcrop in convex, more steeply sloping positions
• Tishar and McGinnis soils that have slopes of less than 60 percent or more than 80 percent

Major Use

Woodland

Major Management Limitations

Tishar and McGinnis

• Steepness of slope
• Hazards of erosion and compaction
• High amount of rock fragments on the surface and in the soil
• Hazard of slope failure
• Plant competition
• Seedling mortality
• Moderately slow permeability

McGinnis

• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Highlead or other cable logging systems are best suited to this unit.
• Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
• To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Headwall areas should be avoided when constructing roads.
• Undesirable plants limit natural or artificial

reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Trees on the McGinnis soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

252F—Tishar-McGinnis complex, 30 to 60 percent south slopes

Composition

Tishar soil and similar inclusions—40 percent
McGinnis soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Tishar—concave side slopes; McGinnis—convex side slopes
Parent material: Colluvium and residuum derived from sandstone, siltstone, and metamorphic rock
Elevation: 600 to 3,200 feet
Native plants: Douglas fir and Pacific madrone with an understory of creambush oceanspray, tall Oregongrape, whipplevine, and mountain brome
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—47 to 54 degrees F
Frost-free period—120 to 220 days

Tishar Soil

Typical profile

0 to 13 inches—dark brown gravelly silty clay loam
13 to 22 inches—yellowish red very gravelly silty clay
22 to 52 inches—yellowish red very gravelly clay
52 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

McGinnis Soil

Typical profile

0 to 4 inches—dark brown very gravelly clay loam
4 to 10 inches—dark brown gravelly clay loam
10 to 28 inches—reddish brown very gravelly silty clay
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 3 inches

Contrasting Inclusions

• Acker and Norling soils
• Atring and Vermisa soils in convex, more steeply sloping positions
• Dumont and Zing soils in concave, less sloping positions
• Tishar and McGinnis soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Tishar and McGinnis

• Steepness of slope
• Hazards of erosion and compaction
• High amount of rock fragments on the surface and in the soil
• Seedling mortality
• Plant competition
• Moderately slow permeability

McGinnis

• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.

• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees on the McGinnis soil commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

252G—Tishar-McGinnis complex, 60 to 80 percent south slopes

Composition

Tishar soil and similar inclusions—40 percent
McGinnis soil and similar inclusions—35 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Tishar—concave side slopes; McGinnis—convex side slopes
Parent material: Colluvium derived from sandstone, siltstone, and metamorphic rock
Elevation: 600 to 3,200 feet
Native plants: Douglas fir and Pacific madrone with an understory of creambush oceanspray, tall Oregongrape, whipplevine, and mountain brome
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—47 to 54 degrees F
Frost-free period—120 to 220 days

Tishar Soil

Typical profile

0 to 13 inches—dark brown gravelly silty clay loam
13 to 22 inches—yellowish red very gravelly silty clay
22 to 52 inches—yellowish red very gravelly clay
52 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5.5 inches

McGinnis Soil

Typical profile

0 to 4 inches—dark brown very gravelly clay loam
4 to 10 inches—dark brown gravelly clay loam
10 to 28 inches—reddish brown very gravelly silty clay
28 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 3 inches

Contrasting Inclusions

• Acker and Norling soils
• Atring, Kanid, and Vermisa soils and Rock outcrop in convex, more steeply sloping positions
• Tishar and McGinnis soils that have slopes of less than 60 percent or more than 80 percent

Major Use

Woodland

Major Management Limitations

Tishar and McGinnis

• Steepness of slope
• Hazards of erosion and compaction
• High amount of rock fragments on the surface and in the soil
• Hazard of slope failure
• Seedling mortality
• Plant competition
• Moderately slow permeability

McGinnis

• Hazard of windthrow
• Depth to rock

Use and Management

Woodland

• Highlead or other cable logging systems are best suited to this unit.
• Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.

• To reduce the risk of compaction, use suitable logging systems and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Headwall areas should be avoided when constructing roads.
• Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• Trees on the McGinnis soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

253F—Umpcoos-Rock outcrop-Damewood complex, 30 to 60 percent slopes

Composition

Umpcoos soil and similar inclusions—30 percent
Rock outcrop—30 percent
Damewood soil and similar inclusions—20 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Umpcoos and Damewood—side slopes and ridges; Rock outcrop—side slopes
Parent material: Colluvium derived from sandstone
Elevation: 200 to 2,200 feet
Native plants: Umpcoos—Douglas fir and Pacific madrone with an understory of cascade Oregongrape, common beargrass, whipplevine, and Alaska oniongrass; Damewood—Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—70 to 110 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Umpcoos Soil

Typical profile

0 to 4 inches—dark brown very gravelly sandy loam
4 to 17 inches—dark brown very gravelly sandy loam
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 1 inch

Rock outcrop

Description: Areas of exposed bedrock

Damewood Soil

Typical profile

0 to 11 inches—very dark brown very gravelly loam
11 to 29 inches—dark brown extremely gravelly loam
29 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Contrasting Inclusions

• Bohannon soils
• Preacher soils in concave, less sloping positions
• Soils that are similar to the Damewood soil but have bedrock at a depth of more than 40 inches
• Damewood soils that have slopes of less than 30 percent or more than 60 percent
• Umpcoos soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Map unit

• Areas of Rock outcrop

Umpcoos and Damewood

• Steepness of slope
• Hazard of erosion
• High amount of rock fragments on the surface and in the soil
• Depth to rock
• Seedling mortality
• Plant competition

Umpcoos

- Hazard of windthrow

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, skid trails, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Avoiding areas with a high amount of Rock outcrop will minimize breakage of timber and increase the efficiency of yarding operations.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Umpcoos soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

253G—Umpcoos-Rock outcrop-Damewood complex, 60 to 90 percent slopes

Composition

Umpcoos soil and similar inclusions—30 percent
Rock outcrop—30 percent
Damewood soil and similar inclusions—20 percent
Contrasting inclusions—20 percent

Setting

Landform: Mountains
Landscape position: Side slopes and headwalls
Parent material: Colluvium derived from sandstone
Elevation: 200 to 2,200 feet
Native plants: Damewood—Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple; Umpcoos—Douglas fir and Pacific madrone with an understory of cascade Oregongrape, common beargrass, whipplevine, and Alaska oniongrass
Climatic factors:
Mean annual precipitation—70 to 110 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Umpcoos Soil

Typical profile

0 to 4 inches—dark brown very gravelly sandy loam
4 to 17 inches—dark brown very gravelly sandy loam
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 1 inch

Rock outcrop

Description: Areas of exposed bedrock

Damewood Soil

Typical profile

0 to 11 inches—very dark brown very gravelly loam
11 to 29 inches—dark brown extremely gravelly loam
29 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: About 3.5 inches

Contrasting Inclusions

- Bohannon soils
- Preacher soils in concave, less sloping positions
- Soils that are similar to the Damewood soil but have bedrock at a depth of more than 40 inches
- Damewood and Umpcoos soils that have slopes of less than 60 percent or more than 90 percent

Major Use

Woodland

Major Management Limitations

Map unit

- Areas of Rock outcrop

Umpcoos and Damewood

- Steepness of slope

- Hazard of erosion
- Hazard of slope failure
- High amount of rock fragments on the surface and in the soil
- Depth to rock
- Seedling mortality
- Plant competition

Umpcoos

- Hazard of windthrow

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- Avoiding areas with a high amount of Rock outcrop will minimize breakage of timber and increase the efficiency of yarding operations.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Headwall areas should be avoided when constructing roads.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Umpcoos soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

254G—Vena-Rock outcrop complex, 60 to 100 percent slopes

Composition

Vena soil and similar inclusions—65 percent
Rock outcrop—10 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: South-facing side slopes and headwalls (fig. 13)
Parent material: Colluvium derived from welded tuff
Elevation: 1,000 to 3,500 feet
Native plants: Douglas fir and Pacific madrone with an understory of creambush oceanspray, whipplevine, cascade Oregongrape, and western fescue
Climatic factors:
Mean annual precipitation—50 to 60 inches
Mean annual air temperature—46 to 50 degrees F
Frost-free period—100 to 160 days

Vena Soil

Typical profile

0 to 5 inches—dark yellowish brown very gravelly loam
5 to 21 inches—dark yellowish brown extremely gravelly loam
21 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderate
Available water capacity: About 2.5 inches

Rock outcrop

Description: Areas of exposed bedrock

Contrasting Inclusions

- Kilchis soils in convex positions and in more steeply sloping positions
- Areas of talus below Rock outcrop
- Chamate soils in concave, less sloping positions
- Vena soils that have slopes of less than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Areas of Rock outcrop
- Hazard of erosion
- High amount of rock fragments on the surface and in the soil
- Hazard of slope failure
- Seedling mortality
- Plant competition
- Hazard of windthrow
- Depth to rock
- Hazard of fire damage

Figure 13.—Area of Vena-Rock outcrop complex, 60 to 100 percent slopes, in background. Chamate extremely gravelly loam, 3 to 30 percent slopes, in foreground.

Use and Management

Woodland

- Highlead or other cable logging systems are best suited to this unit.
- When the soil is dry, landings can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
- Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
- Avoiding areas with a high amount of Rock outcrop will minimize breakage of timber and increase the efficiency of yarding operations.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Headwall areas should be avoided when constructing roads.
- Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

255C—Veneta loam, 0 to 12 percent slopes

Composition

Veneta soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Alluvial fans and terraces
Parent material: Mixed alluvium and colluvium derived from sandstone and siltstone
Elevation: 100 to 1,200 feet
Native plants: Douglas fir, Pacific madrone, and Oregon white oak with an understory of Pacific poison oak, common snowberry, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 9 inches—dark brown loam
9 to 18 inches—strong brown loam
18 to 30 inches—brown and strong brown clay loam
30 to 63 inches—mottled, strong brown and grayish brown clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 48 to 72 inches in November through May
Permeability: Slow
Available water capacity: About 10 inches
Shrink-swell potential: High

Contrasting Inclusions

- Dupee, Pengra, and Sutherlin soils
- Bateman, Pollard, Rosehaven, and Windygap silt loams in convex positions
- Nonpareil soils in convex, more steeply sloping positions
- Oakland and Speaker soils in convex positions
- Panther soils in concave positions and near drainageways
- Veneta soils that have slopes of more than 12 percent

Major Uses

Cropland, pasture, woodland, and homesite development

Major Management Limitations

- Hazards of compaction and erosion
- Slow permeability
- Plant competition

Use and Management

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

- Because the soil is unsuited to traffic when wet, use equipment only during dry periods.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Seed cuts and fills to permanent vegetation.

255D—Veneta loam, 12 to 20 percent slopes

Composition

Veneta soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills
Landscape position: Alluvial fans and footslopes
Parent material: Mixed alluvium and colluvium derived from sandstone and siltstone
Elevation: 100 to 1,200 feet
Native plants: Douglas fir, Pacific madrone, and Oregon white oak with an understory of Pacific poison oak, common snowberry, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 9 inches—dark brown loam
9 to 18 inches—strong brown loam
18 to 30 inches—brown and strong brown clay loam
30 to 63 inches—mottled, strong brown and grayish brown clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 48 to 72 inches in November through May
Permeability: Slow
Available water capacity: About 10 inches
Shrink-swell potential: High

Contrasting Inclusions

- Dupee, Pengra, and Veneta soils
- Bateman, Pollard, Rosehaven, and Windygap silt loams in convex positions
- Nonpareil soils in convex, more steeply sloping positions
- Oakland and Speaker soils in convex positions
- Panther soils in concave positions and near drainageways
- Veneta soils that have slopes of less than 12 percent or more than 20 percent

Major Uses

Cropland, pasture, woodland, and homesite development

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Slow permeability
- Hazard of slope failure
- Plant competition

Use and Management

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Woodland

- Because the soil is unsuited to traffic when wet, use equipment only during dry periods.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore,

onsite investigation may be needed before disturbing the soil.

• Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Slumping can be minimized by restricting the construction of roads and other activities that disturb the soil to the less sloping or more well drained areas and by using properly designed road drainage systems.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

256G—Vermisa-Rock outcrop complex, 60 to 100 percent south slopes

Composition

Vermisa soil and similar inclusions—45 percent
Rock outcrop—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes and headwalls
Parent material: Colluvium derived from sandstone and metamorphic rock
Elevation: 400 to 4,000 feet
Native plants: Douglas fir with an understory of hairy honeysuckle, Pacific poison oak, canyon live oak, and California fescue
Climatic factors:
Mean annual precipitation—35 to 60 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 200 days

Vermisa Soil

Typical profile

0 to 4 inches—dark yellowish brown very gravelly loam
4 to 17 inches—yellowish brown extremely gravelly loam
17 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 10 to 20 inches
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: About 2 inches

Rock outcrop

Description: Areas of exposed bedrock

Contrasting Inclusions

• Atring soils
• Kanid soils in concave, less sloping positions
• Reston soils near areas of Rock outcrop
• Areas of talus below Rock outcrop
• Vermisa soils that have slopes of less than 60 percent

Major Use

Woodland

Major Management Limitations

• Steepness of slope
• Areas of Rock outcrop
• Hazard of erosion
• High amount of rock fragments on the surface and in the soil
• Hazard of slope failure
• Seedling mortality
• Plant competition
• Hazard of windthrow
• Depth to rock
• Hazard of fire damage

Use and Management

Woodland

• Highlead or other cable logging systems are best suited to this unit.
• Reduce the risk of erosion by seeding roads, roadfills, and landings and by installing water bars.
• Roadcuts on this unit do not respond well to seeding or mulching because of the large amount of exposed, fractured bedrock.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.

• End hauling of waste material minimizes damage to vegetation downslope and reduces the potential for sedimentation.
• Avoiding areas with a high amount of Rock outcrop will minimize breakage of timber and increase the efficiency of yarding operations.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
• Headwall areas should be avoided when constructing roads.
• Providing artificial shade, leaving some of the larger trees to provide shade, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
• An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
• Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

257A—Waldo silty clay loam, 0 to 3 percent slopes

Composition

Waldo soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Flood plains
Landscape position: Intermediate flood plains
Parent material: Clayey alluvium
Elevation: 100 to 1,500 feet
Native plants: Oregon white oak and Oregon ash with an understory of common snowberry, Pacific poison oak, rose, and blue wildrye
Climatic factors:
Mean annual precipitation—30 to 60 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 11 inches—very dark grayish brown silty clay loam
11 to 24 inches—very dark grayish brown clay
24 to 60 inches—gray clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Poorly drained
Depth to water table: At the surface to a depth of 6 inches below the surface in November through May
Permeability: Slow
Available water capacity: About 10 inches
Frequency of flooding: Occasional in December through March
Shrink-swell potential: High

Contrasting Inclusions

• Conser and Redbell soils on terraces
• Malabon and Coburg soils on higher flood plains

Major Uses

Hay and pasture, and wetland management

Major Management Limitations

• Wetness
• Hazard of flooding
• Hazard of compaction
• High shrink-swell potential
• Slow permeability
• Low soil strength

Use and Management

Hay and pasture

• Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Leveling is needed in sloping areas.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
• Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Select plants that can tolerate wetness.
• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

258C—Waldport fine sand, 0 to 12 percent slopes

Composition

Waldport soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Dunes
Landscape position: Recently stabilized sand dunes
Parent material: Eolian sand
Elevation: 10 to 500 feet
Native plants: Sitka spruce and shore pine with an understory of salal, evergreen huckleberry, red huckleberry, and Pacific rhododendron
Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—51 to 53 degrees F
Frost-free period—180 to 240 days

Typical Profile

0 to 3 inches—very dark grayish brown fine sand
3 to 62 inches—dark grayish brown fine sand

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: About 3.5 inches
Hazard of wind erosion: High

Contrasting Inclusions

- Netarts soils
- Duneland
- Heceta soils in concave positions
- Waldport soils that have slopes of more than 12 percent

Major Uses

Recreation, wildlife habitat, and homesite development

Major Management Limitations

- Hazard of wind erosion
- Very rapid permeability
- Coarse texture
- Droughtiness

Use and Management

Recreation and homesite development

- Reduce the risk of wind erosion by maintaining plant cover, revegetating disturbed areas as soon as possible, surfacing paths, and controlling traffic.
- Establish and maintain plant cover by fertilizing, seeding, and mulching and by shaping the slopes.
- Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.
- Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
- In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

258E—Waldport fine sand, 12 to 30 percent slopes

Composition

Waldport soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Dunes
Landscape position: Recently stabilized sand dunes
Parent material: Eolian sand
Elevation: 10 to 500 feet
Native plants: Sitka spruce and shore pine with an understory of salal, evergreen huckleberry, red huckleberry, and Pacific rhododendron
Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—51 to 53 degrees F
Frost-free period—180 to 240 days

Typical Profile

0 to 3 inches—very dark grayish brown fine sand
3 to 62 inches—dark grayish brown fine sand

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: About 3.5 inches
Hazard of wind erosion: High

Contrasting Inclusions

- Netarts soils
- Duneland
- Heceta soils in concave positions
- Waldport soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Recreation, wildlife habitat, and homesite development

Major Management Limitations

- Hazard of wind erosion
- Steepness of slope
- Very rapid permeability
- Coarse texture
- Droughtiness

Use and Management

Recreation and homesite development

- Reduce the risk of wind erosion by maintaining plant cover, revegetating disturbed areas as soon as possible, surfacing paths, and controlling traffic.
- Establish and maintain plant cover by fertilizing, seeding, and mulching and by shaping the slopes.
- Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

258F—Waldport fine sand, 30 to 70 percent slopes

Composition

Waldport soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Dunes
Landscape position: Recently stabilized sand dunes
Parent material: Eolian sand
Elevation: 10 to 500 feet
Native plants: Sitka spruce and shore pine with an understory of salal, evergreen huckleberry, red huckleberry, and Pacific rhododendron
Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—51 to 53 degrees F
Frost-free period—180 to 240 days

Typical Profile

0 to 3 inches—very dark grayish brown fine sand
3 to 62 inches—dark grayish brown fine sand

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: About 3.5 inches
Hazard of wind erosion: High

Contrasting Inclusions

- Netarts soils
- Duneland
- Waldport soils that have slopes of less than 30 percent

Major Uses

Recreation and wildlife habitat

Major Management Limitations

- Steepness of slope
- Hazard of wind erosion
- Very rapid permeability
- Coarse texture
- Droughtiness

Use and Management

Recreation

- Reduce the risk of wind erosion by maintaining plant cover, revegetating disturbed areas as soon as possible, surfacing paths, and controlling traffic.
- Establish and maintain plant cover by fertilizing, seeding, and mulching and by shaping the slopes.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.

259E—Waldport fine sand, thin surface, 0 to 30 percent slopes

Composition

Waldport soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Dunes
Landscape position: Recently stabilized sand dunes on narrow, sharply undulating, low foredunes adjacent to the beach
Parent material: Eolian sand
Elevation: 5 to 50 feet
Native plants: European beachgrass (fig. 14) and scattered shore pine

Figure 14.—European beachgrass in an area of Waldport fine sand, thin surface, 0 to 30 percent slopes, in foreground. Beaches is in center, and the Pacific Ocean is in background.

Climatic factors:
Mean annual precipitation—70 to 80 inches
Mean annual air temperature—51 to 53 degrees F
Frost-free period—200 to 240 days

Typical Profile

0 to 2 inches—very dark grayish brown fine sand
2 to 63 inches—dark grayish brown fine sand

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Excessively drained
Permeability: Very rapid
Available water capacity: About 3.5 inches
Hazard of wind erosion: High

Contrasting Inclusions

- Netarts soils
- Duneland
- Heceta soils in concave, less sloping positions
- Waldport soils that have slopes of more than 30 percent

Major Uses

Recreation and wildlife habitat

Major Management Limitations

- Hazard of wind erosion
- Steepness of slope
- Very rapid permeability
- Coarse texture
- Droughtiness

Use and Management

Recreation

- Reduce the risk of wind erosion by maintaining plant cover, revegetating disturbed areas as soon as possible, surfacing paths, and controlling traffic.
- Establish and maintain plant cover by fertilizing, seeding, and mulching and by shaping the slopes.
- Construct special retainer walls in shallow excavations to prevent cutbanks from caving in.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.

• Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.

260A—Wasson loam, 0 to 3 percent slopes

Composition

Wasson soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Flood plains
Landscape position: Swales on intermediate flood plains
Parent material: Mixed alluvium
Elevation: 20 to 200 feet
Native plants: Oregon ash and red alder with an understory of western swordfern, salmonberry, rushes, and sedges
Climatic factors:
Mean annual precipitation—60 to 90 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—160 to 240 days

Typical Profile

0 to 8 inches—very dark grayish brown loam
8 to 12 inches—very dark grayish brown very fine sandy loam
12 to 60 inches—stratified, very dark gray loamy fine sand and fine sandy loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Poorly drained
Depth to water table: At the surface to a depth of 24 inches below the surface in November through May
Permeability: Moderate
Available water capacity: About 8 inches
Frequency of flooding: Occasional in December through March

Contrasting Inclusions

• Quosatana soils
• Kirkendall and Nekoma soils on higher flood plains
• Meda soils on terraces

Major Uses

Wildlife habitat and wetland management

Major Management Limitations

• Wetness
• Hazard of flooding
• Hazard of compaction
• Coarse texture

261A—Willanch fine sandy loam, 0 to 3 percent slopes

Composition

Willanch soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Flood plains
Landscape position: Swales on low flood plains
Parent material: Mixed alluvium
Elevation: 10 to 40 feet
Native plants: Red alder and cascara with an understory of rushes, sedges, bentgrass, and willow
Climatic factors:
Mean annual precipitation—70 to 90 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—160 to 240 days

Typical Profile

0 to 11 inches—very dark grayish brown fine sandy loam
11 to 35 inches—dark brown and dark grayish brown fine sandy loam
35 to 60 inches—gray loamy fine sand

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Poorly drained
Depth to water table: 6 inches above the surface to a depth of 24 inches below the surface in November through March
Permeability: Moderately rapid
Available water capacity: About 7 inches
Frequency of flooding: Frequent in December through March

Contrasting Inclusions

• Bragton and Coquille soils
• Nestucca and Yachats soils on higher flood plains
• Lint soils on terraces

Major Uses

Hay and pasture, wildlife habitat, and wetland management

Major Management Limitations

- Hazard of flooding
- Wetness
- Hazard of compaction
- Coarse texture

Use and Management

Hay and pasture

- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate wetness.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

262C—Windygap silt loam, 2 to 12 percent slopes

Composition

Windygap soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills of the Interior Mountains
Landscape position: Toeslopes and broad ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 7 inches—dark brown silt loam
7 to 55 inches—dark red silty clay
55 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

- Bellpine soils in convex, more steeply sloping positions
- Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways
- Windygap soils that have slopes of more than 12 percent

Major Uses

Woodland, cropland, pasture, and homesite development

Major Management Limitations

- Hazards of compaction and erosion
- Plant competition
- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Use conventional equipment in harvesting, but limit its use when the soil is wet.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.

• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Roads should be designed to offset the limited ability of the soil to support a load.
• Seed cuts and fills to permanent vegetation.

262E—Windygap silt loam, 12 to 30 percent slopes

Composition

Windygap soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills of the Interior Mountains
Landscape position: Footslopes and broad ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 7 inches—dark brown silt loam
7 to 55 inches—dark red silty clay
55 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

• Bellpine soils in convex, more steeply sloping positions
• Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways
• Windygap soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Woodland, cropland, pasture, and homesite development

Major Management Limitations

• Hazards of erosion and compaction
• Steepness of slope
• Plant competition
• Hazard of slope failure
• Moderately slow permeability
• Low soil strength

Use and Management

Woodland

• Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
• Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.

• Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Cropland

• Sprinkler and trickle irrigation systems are suited to the less sloping areas of this unit. The method used generally is governed by the crop grown.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Roads should be designed to offset the limited ability of the soil to support a load.
• Slumping can be minimized by restricting the construction of roads and other activities that disturb the soil to the less sloping areas and by using properly designed road drainage systems.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

262F—Windygap silt loam, 30 to 60 percent slopes

Composition

Windygap soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Interior Mountains
Landscape position: Side slopes and ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 7 inches—dark brown silt loam
7 to 55 inches—dark red silty clay
55 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Contrasting Inclusions

• Kanid soils
• Bellpine soils in convex positions
• Atring soils in convex, more steeply sloping positions
• Dupee and Sutherlin soils in concave, less sloping positions
• Windygap soils that have slopes of less than 30 percent or more than 60 percent

Major Uses

Woodland and pasture

Major Management Limitations

• Steepness of slope
• Hazards of erosion and compaction
• Hazard of slope failure
• Plant competition
• Moderately slow permeability
• Low soil strength

Use and Management

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
• Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.
• Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

263C—Windygap clay loam, 2 to 12 percent slopes

Composition

Windygap soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills of the Klamath Mountains
Landscape position: Toeslopes and broad ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 700 to 2,700 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, cascade Oregongrape, and Alaska oniongrass
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—120 to 200 days

Typical Profile

0 to 4 inches—dark brown clay loam
4 to 7 inches—reddish brown clay loam
7 to 16 inches—yellowish red clay
16 to 58 inches—red silty clay
58 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8.5 inches

Contrasting Inclusions

• Acker and Norling soils that are in convex positions and are derived from sandstone
• Chimneyrock soils derived from conglomerate
• Bellpine soils in convex, more steeply sloping positions
• Dicecreek soils in convex positions
• McNab soils in concave positions and near drainageways
• Windygap soils that have slopes of more than 12 percent

Major Uses

Woodland, cropland, pasture, and homesite development

Major Management Limitations

• Hazards of compaction and erosion
• Plant competition
• Moderately slow permeability
• Low soil strength

Use and Management

Woodland

• Use conventional equipment in harvesting, but limit its use when the soil is wet.
• Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.

• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Cropland

• Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
• Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
• Regulate the application of irrigation water to control runoff and erosion.
• Erosion can be minimized if fall grain is seeded early and conservation tillage is used. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Roads should be designed to offset the limited ability of the soil to support a load.
• Seed cuts and fills to permanent vegetation.

263E—Windygap clay loam, 12 to 30 percent slopes

Composition

Windygap soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Klamath Mountains
Landscape position: Side slopes and broad ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 700 to 2,700 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, cascade Oregongrape, and Alaska oniongrass
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—120 to 200 days

Typical Profile

0 to 4 inches—dark brown clay loam
4 to 7 inches—reddish brown clay loam
7 to 16 inches—yellowish red clay
16 to 58 inches—red silty clay
58 inches—soft bedrock

Soil Properties and Qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8.5 inches

Contrasting Inclusions

• Acker and Norling soils that are in convex positions and are derived from sandstone
• Chimneyrock soils derived from conglomerate
• Bellpine and Dicecreek soils in convex, more steeply sloping positions
• McNab soils in concave positions and near drainageways
• Windygap soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Woodland, cropland, pasture, and homesite development

Major Management Limitations

• Hazards of erosion and compaction
• Steepness of slope

- Plant competition
- Hazard of slope failure
- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

Cropland

- Sprinkler and trickle irrigation systems are suited to the less sloping areas of this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the limited ability of the soil to support a load.
- Slumping can be minimized by restricting the construction of roads and other activities that disturb the soil to the less sloping areas and by using properly designed road drainage systems.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

264E—Windygap-Bellpine complex, 12 to 30 percent slopes

Composition

Windygap soil and similar inclusions—45 percent
Bellpine soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Hills of the Interior Mountains
Landscape position: Windygap—concave side slopes and broad ridges; Bellpine—convex side slopes and broad ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 250 to 2,600 feet
Native plants: Douglas fir and grand fir with an understory of salal, western swordfern, cascade Oregongrape, and whipplevine

Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Windygap Soil

Typical profile

0 to 7 inches—dark brown silt loam
7 to 55 inches—dark red silty clay
55 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches

Bellpine Soil

Typical profile

0 to 11 inches—dark brown and dark reddish brown silt loam
11 to 30 inches—yellowish red silty clay
30 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 4.5 inches

Contrasting Inclusions

- Dupee, Pengra, and Sutherlin soils in concave positions and near drainageways
- Windygap and Bellpine soils that have slopes of less than 12 percent or more than 30 percent

Major Uses

Woodland, cropland, pasture, and homesite development

Major Management Limitations

Windygap and Bellpine

- Hazards of erosion and compaction
- Steepness of slope
- Plant competition
- Low soil strength
- Moderately slow permeability

Windygap

- Hazard of slope failure

Bellpine

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings on south- and west-facing slopes helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees on the Bellpine soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Cropland

- Sprinkler and trickle irrigation systems are suited to the less sloping areas of this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope.

Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Septic tank absorption fields can be installed in areas of this unit that are deeper to bedrock. Onsite investigation is needed to locate these areas.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Roads should be designed to offset the limited ability of the soils to support a load.
• Slumping can be minimized by restricting the construction of roads and other activities that disturb the soil to the less sloping areas and by using properly designed road drainage systems.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

265F—Windygap-Bellpine complex, 30 to 60 percent north slopes

Composition

Windygap soil and similar inclusions—45 percent
Bellpine soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Klamath Mountains
Landscape position: Windygap—concave side slopes; Bellpine—convex side slopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 700 to 2,700 feet
Native plants: Douglas fir and grand fir with an understory of salal, golden chinkapin, cascade Oregongrape, and Alaska oniongrass
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—120 to 200 days

Windygap Soil

Typical profile

0 to 4 inches—dark brown clay loam
4 to 7 inches—reddish brown clay loam
7 to 16 inches—yellowish red clay
16 to 58 inches—red silty clay
58 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8.5 inches

Bellpine Soil

Typical profile

0 to 3 inches—dark brown clay loam
3 to 18 inches—brown clay loam
18 to 25 inches—strong brown clay
25 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5 inches

Contrasting Inclusions

• Acker and Norling soils that are in convex positions and are derived from sandstone
• Chimneyrock soils derived from conglomerate
• Atring soils in convex, more steeply sloping positions
• Dicecreek soils in convex positions
• McNab soils in concave, less sloping positions
• Windygap and Bellpine soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Windygap and Bellpine

• Steepness of slope

- Hazards of erosion and compaction
- Plant competition
- Low soil strength
- Moderately slow permeability

Windygap

- Hazard of slope failure

Bellpine

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees on the Bellpine soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

266F—Windygap-Bellpine complex, 30 to 60 percent south slopes

Composition

Windygap soil and similar inclusions—45 percent
Bellpine soil and similar inclusions—30 percent
Contrasting inclusions—25 percent

Setting

Landform: Klamath Mountains
Landscape position: Windygap—concave side slopes; Bellpine—convex side slopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 700 to 2,700 feet
Native plants: Douglas fir and grand fir with an understory of tall Oregongrape, hairy honeysuckle, Pacific poison oak, and California fescue
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—120 to 200 days

Windygap Soil

Typical profile

0 to 4 inches—dark brown clay loam
4 to 7 inches—reddish brown clay loam
7 to 16 inches—yellowish red clay
16 to 58 inches—red silty clay
58 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8.5 inches

Bellpine Soil

Typical profile

0 to 3 inches—dark brown clay loam
3 to 18 inches—brown clay loam
18 to 25 inches—strong brown clay
25 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5 inches

Contrasting Inclusions

- Acker and Norling soils that are in convex positions and are derived from sandstone
- Chimneyrock soils derived from conglomerate
- Atring soils in convex, more steeply sloping positions
- Dicecreek soils in convex positions

- McNab soils in concave, less sloping positions
- Windygap and Bellpine soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

Windygap and Bellpine

- Steepness of slope
- Hazards of erosion and compaction
- Seedling mortality
- Plant competition
- Low soil strength
- Moderately slow permeability

Windygap

- Hazard of slope failure

Bellpine

- Hazard of windthrow
- Depth to rock

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars and culverts.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping areas or in areas of more suitable soils and by using properly designed road drainage systems.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees on the Bellpine soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

267C—Wintley silt loam, 0 to 12 percent slopes

Composition

Wintley soil and similar inclusions—80 percent
Contrasting inclusions—20 percent

Setting

Landform: Terraces
Landscape position: High terraces
Parent material: Mixed alluvium
Elevation: 80 to 800 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—60 to 90 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—160 to 240 days

Typical Profile

0 to 4 inches—very dark grayish brown silt loam
4 to 19 inches—dark yellowish brown and dark brown silty clay loam
19 to 60 inches—strong brown silty clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10 inches
Shrink-swell potential: High

Contrasting Inclusions

- Bickford soils
- Kirkendall and Nekoma soils on flood plains
- Meda soils on alluvial fans
- Wintley soils that have slopes of more than 12 percent

Major Use

Woodland

Major Management Limitations

- Hazards of compaction and erosion
- Plant competition
- Moderately slow permeability
- High shrink-swell potential
- Low soil strength

Use and Management

Woodland

- Use conventional equipment in harvesting, but limit its use when the soil is wet.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

268E—Wolfpeak sandy loam, 3 to 30 percent slopes

Composition

Wolfpeak soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Footslopes and ridges
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 700 to 2,100 feet
Native plants: Douglas fir and sugar pine with an understory of Pacific poison oak, tall Oregongrape, whipplevine, and California fescue
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—49 to 53 degrees F
Frost-free period—150 to 200 days

Typical Profile

0 to 8 inches—very dark grayish brown and dark brown sandy loam
8 to 18 inches—strong brown sandy loam
18 to 48 inches—strong brown loam
48 to 60 inches—strong brown clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8.5 inches

Contrasting Inclusions

- Josephine, Pollard, and Dumont soils derived from metamorphic rock
- Tethrick soils in more steeply sloping positions
- Siskiyou soils in convex, more steeply sloping positions
- Zing soils in concave positions and near drainageways
- Wolfpeak soils that have slopes of more than 30 percent

Major Uses

Woodland, hay and pasture, and homesite development

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Plant competition
- Seedling mortality
- Moderately slow permeability
- Hazard of fire damage

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars (fig. 15).
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial

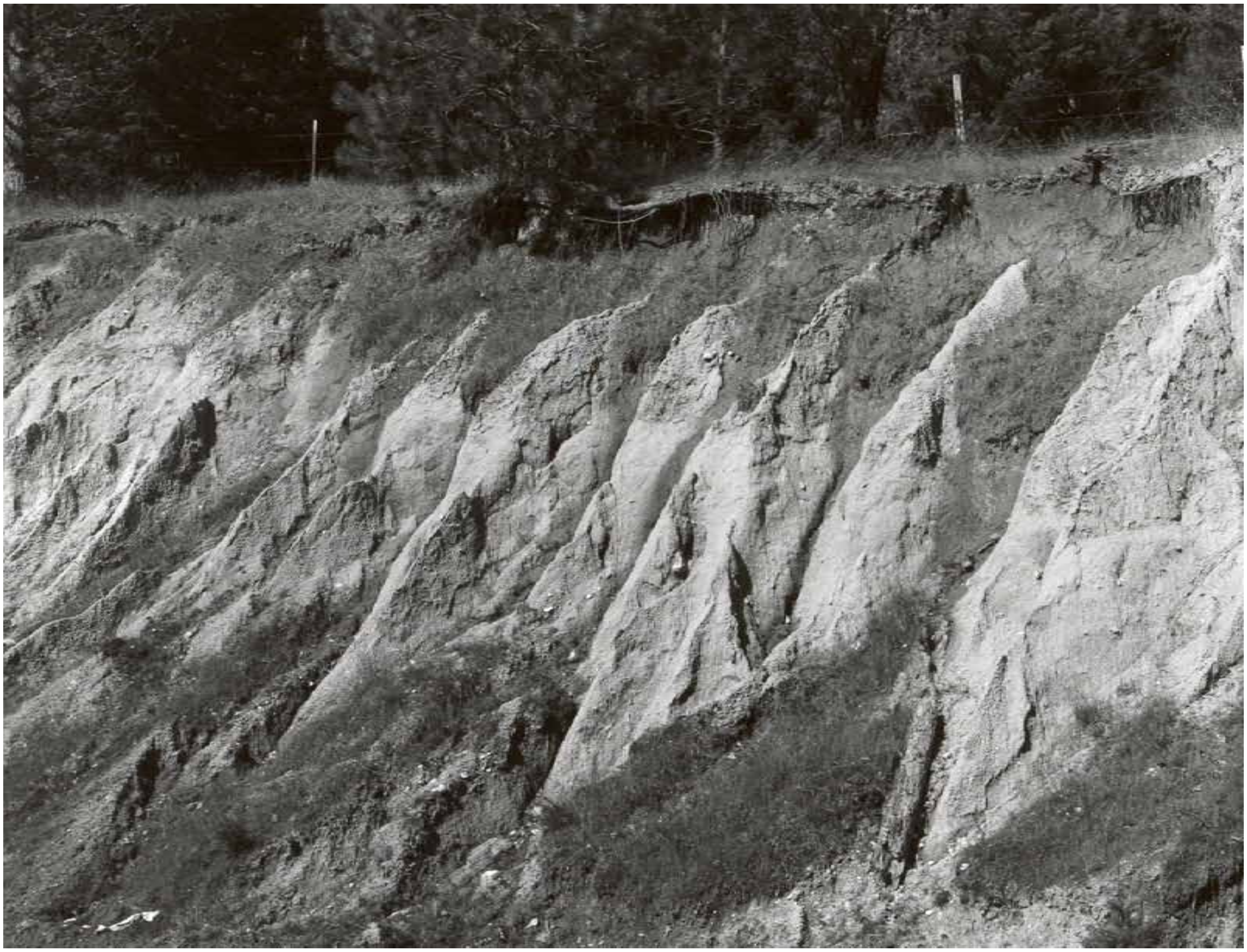


Figure 15.—Severe erosion on a roadcut in an area of Wolfpeak sandy loam, 3 to 30 percent slopes. Soils that formed in granodiorite are very erosive.

reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.

- Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

269F—Wolfpeak sandy loam, 30 to 60 percent north slopes

Composition

Wolfpeak soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 700 to 2,200 feet
Native plants: Douglas fir and incense cedar with an understory of creambush oceanspray, cascade Oregongrape, and western fescue
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—49 to 53 degrees F
Frost-free period—150 to 200 days

Typical Profile

0 to 8 inches—very dark grayish brown and dark brown sandy loam
8 to 18 inches—strong brown sandy loam
18 to 48 inches—strong brown loam
48 to 60 inches—strong brown clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8.5 inches

Contrasting Inclusions

- Josephine, Pollard, and Dumont soils derived from metamorphic rock
- Tethrick soils in more steeply sloping positions
- Siskiyou soils in convex, more steeply sloping positions
- Zing soils in concave, less sloping positions
- Wolfpeak soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Plant competition
- Seedling mortality
- Moderately slow permeability
- Hazard of fire damage

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.

270F—Wolfpeak sandy loam, 30 to 60 percent south slopes

Composition

Wolfpeak soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Side slopes
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 700 to 2,200 feet

Native plants: Douglas fir and sugar pine with an understory of Pacific poison oak, tall Oregongrape, whipplevine, and California fescue
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—49 to 53 degrees F
Frost-free period—150 to 200 days

Typical Profile

0 to 8 inches—very dark grayish brown and dark brown sandy loam
8 to 18 inches—strong brown sandy loam
18 to 48 inches—strong brown loam
48 to 60 inches—strong brown clay loam

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8.5 inches

Contrasting Inclusions

- Josephine, Pollard, and Dumont soils derived from metamorphic rock
- Tethrick soils in more steeply sloping positions
- Siskiyou soils in convex, more steeply sloping positions
- Zing soils in concave, less sloping positions
- Wolfpeak soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Hazards of erosion and compaction
- Steepness of slope
- Seedling mortality
- Plant competition
- Hazard of fire damage
- Moderately slow permeability

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Planting larger trees or a higher number of trees in a specified area and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- An increased risk of erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.

271E—Wolfpeak-Beal-Zing complex, 3 to 30 percent slopes

Composition

Wolfpeak soil and similar inclusions—35 percent
Beal soil and similar inclusions—30 percent
Zing soil and similar inclusions—25 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Wolfpeak—footslopes and convex side slopes; Beal and Zing—footslopes and concave side slopes
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 800 to 2,100 feet
Native plants: Douglas fir and sugar pine with an understory of Pacific poison oak, tall Oregongrape, whipplevine, and California fescue
Climatic factors:
Mean annual precipitation—35 to 40 inches
Mean annual air temperature—49 to 53 degrees F
Frost-free period—150 to 200 days

Wolfpeak Soil

Typical profile

0 to 8 inches—very dark grayish brown and dark brown sandy loam
8 to 18 inches—strong brown sandy loam
18 to 48 inches—strong brown loam
48 to 60 inches—strong brown clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 8.5 inches

Beal Soil

Typical profile

0 to 10 inches—very dark grayish brown and dark brown loam
10 to 18 inches—dark yellowish brown loam
18 to 39 inches—dark yellowish brown clay loam
39 to 60 inches—olive clay loam and clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Depth to water table: 24 to 36 inches in November through May
Permeability: Moderately slow
Available water capacity: About 10 inches

Zing Soil

Typical profile

0 to 7 inches—dark brown loam
7 to 10 inches—dark brown clay loam
10 to 17 inches—dark yellowish brown clay
17 to 45 inches—gray clay
45 to 62 inches—light olive gray clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 24 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Tethrick soils in more steeply sloping positions
- Siskiyou soils in convex, more steeply sloping positions
- Wolfpeak and Beal soils that have slopes of more than 30 percent

Major Uses

Woodland, hay and pasture, and homesite development

Major Management Limitations

Wolfpeak, Beal, and Zing

- Hazards of erosion and compaction
- Hazard of slope failure
- Plant competition
- Steepness of slope
- Hazard of fire damage

Wolfpeak

- Seedling mortality
- Moderately slow permeability

Beal

- Wetness
- Moderately slow permeability
- Hazard of windthrow

Zing

- Wetness
- High shrink-swell potential
- Slow permeability
- Low soil strength
- Hazard of windthrow

Use and Management

Woodland

- Because the Beal and Zing soils are unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

• Avoiding very wet areas, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
• Increased erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
• Trees on the Beal and Zing soils commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong.

Hay and pasture

• Maintain fertility and tilth by returning crop residue to the soils and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• In areas of the Beal and Zing soils, select plants that can tolerate wetness.
• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Tillage and seeding should be done on the contour or across the slope where practical.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Alternative waste disposal systems may function properly on this unit. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
• Interceptor ditches can be used to divert subsurface water away from the absorption field.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• For the steeper areas of this unit, install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Roads on the Zing soil should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
• On the Zing soil, prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• Slumping can be minimized by restricting the construction of roads and other activities that disturb the soils to the less sloping or more well drained areas and by using properly designed road drainage systems.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

272E—Xanadu gravelly loam, 3 to 30 percent slopes

Composition

Xanadu soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Broad ridges and side slopes
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 90 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Typical Profile

0 to 8 inches—dark brown gravelly loam
8 to 15 inches—dark reddish brown clay loam
15 to 60 inches—reddish brown and dark red clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9.5 inches

Contrasting Inclusions

• Fernhaven and Preacher soils
• Bohannon and Digger soils in convex, more steeply sloping positions
• Soils that are similar to this Xanadu soil but have bedrock at a depth of less than 40 inches and are in convex, more steeply sloping positions
• Soils that are similar to this Xanadu soil but are

poorly drained and are in concave positions and near drainageways
- Xanadu soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

- Hazards of compaction and erosion
- Plant competition
- Steepness of slope
- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

272F—Xanadu gravelly loam, 30 to 60 percent slopes

Composition

Xanadu soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Mountains
Landscape position: Side slopes and ridges
Parent material: Residuum and colluvium derived from sandstone and siltstone
Elevation: 200 to 3,000 feet
Native plants: Douglas fir and western hemlock with an understory of salal, cascade Oregongrape, Pacific rhododendron, and vine maple
Climatic factors:
Mean annual precipitation—55 to 90 inches
Mean annual air temperature—45 to 53 degrees F
Frost-free period—145 to 240 days

Typical Profile

0 to 8 inches—dark brown gravelly loam
8 to 15 inches—dark reddish brown clay loam
15 to 60 inches—reddish brown and dark red clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 9.5 inches

Contrasting Inclusions

- Fernhaven and Preacher soils
- Bohannon soils in convex positions
- Soils that are similar to this Xanadu soil but have bedrock at a depth of less than 40 inches and are in convex positions
- Damewood and Digger soils in convex, more steeply sloping positions
- Xanadu soils that have slopes of less than 30 percent or more than 60 percent

Major Use

Woodland

Major Management Limitations

- Steepness of slope
- Hazards of erosion and compaction
- Plant competition
- Moderately slow permeability
- Low soil strength

Use and Management

Woodland

- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.

• When the soil is dry, landings and skid trails can be ripped to improve plant growth.
• Undesirable plants prevent natural or artificial reforestation unless intensive site preparation and maintenance are used.

273G—Xerorthents-Rock outcrop complex, 30 to 80 percent slopes

Composition

Xerorthents and similar inclusions—60 percent
Rock outcrop—25 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills
Landscape position: Side slopes
Parent material: Colluvium and residuum derived from mixed sources
Elevation: 400 to 2,000 feet
Native plants: Dominantly scattered Oregon white oak and Pacific madrone with an understory of grasses, shrubs, and forbs; Douglas fir and grand fir at the higher elevations
Climatic factors:
Mean annual precipitation—30 to 45 inches
Mean annual air temperature—48 to 55 degrees F
Frost-free period—150 to 235 days

Xerorthents

Representative profile

0 to 4 inches—dark brown gravelly loam
4 to 14 inches—dark yellowish brown very cobbly clay loam
14 inches—hard bedrock

Soil properties and qualities

Depth to hard bedrock: 4 to 60 inches or more
Drainage class: Well drained
Permeability: Very rapid
Available water capacity: Variable

Rock outcrop

Description: Areas of exposed bedrock

Contrasting Inclusions

• Oakland, Sutherlin, and Bateman soils
• Sweetbriar and Zing soils in concave positions at the higher elevations

Major Uses

Livestock grazing, wildlife habitat, and woodland

Major Management Limitations

• Areas of Rock outcrop
• Steepness of slope
• Depth to rock
• Hazards of erosion and compaction
• Hazard of slope failure

Use and Management

Livestock grazing

• Using a grazing system that controls the timing and duration of grazing and includes a periodic rotation during the season of use helps to maintain plant vigor and allow for seed production.
• Maintaining proper livestock grazing rates and implementing a grazing management system will leave adequate plant residue for protection of the soils and plant roots.
• Brush management and seeding reduce competition from woody plants and improve degraded areas.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.
• Trails or walkways can be constructed to encourage livestock to graze in areas where access is limited.

Woodland

• Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
• Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
• Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
• Proper design of road drainage systems and care in the placement of culverts help to control erosion.
• To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
• When the soils are dry, landings and skid trails can be ripped to improve plant growth.
• This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
• Slumping can be minimized by locating roads in the less sloping areas and by using properly designed road drainage systems.
• Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
• Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.

274A—Yachats fine sandy loam, 0 to 3 percent slopes

Composition

Yachats soil and similar inclusions—75 percent
Contrasting inclusions—25 percent

Setting

Landform: Flood plains
Landscape position: Low flood plains
Parent material: Mixed alluvium
Elevation: 10 to 50 feet
Native plants: Sitka spruce, red alder, and bigleaf maple with an understory of vine maple, western swordfern, and salmonberry
Climatic factors:
Mean annual precipitation—70 to 90 inches
Mean annual air temperature—50 to 53 degrees F
Frost-free period—180 to 240 days

Typical Profile

0 to 12 inches—very dark grayish brown and dark brown fine sandy loam
12 to 55 inches—dark brown fine sandy loam
55 to 60 inches—dark brown sand

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Depth to water table: 48 to 72 inches in November through April
Permeability: Moderately rapid
Available water capacity: About 7.5 inches
Frequency of flooding: Frequent in December through April

Contrasting Inclusions

- Nestucca soils
- Coquille and Willanch soils on lower flood plains
- Lint soils on terraces

Major Uses

Hay and pasture, and wildlife habitat

Major Management Limitations

- Hazard of flooding
- Hazard of compaction
- Coarse texture

Use and Management

Hay and pasture

- Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to control runoff and erosion.
- Reduce the risk of erosion by providing structures along streambanks to control the flow of water and by planting cover crops.
- Maintain fertility and tilth by growing green manure crops, returning crop residue to the soil, and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

275D—Yoncalla silty clay loam, 2 to 20 percent slopes

Composition

Yoncalla soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills
Landscape position: Toeslopes, footslopes, and alluvial fans
Parent material: Colluvium derived from basalt
Elevation: 350 to 2,000 feet
Native plants: Oregon white oak and Pacific madrone with an understory of Pacific poison oak, rose, blue wildrye, and California oatgrass
Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 8 inches—very dark grayish brown silty clay loam
8 to 15 inches—dark brown silty clay loam
15 to 49 inches—brown clay
49 to 60 inches—brown gravelly clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 6 to 30 inches in December through April

Permeability: Very slow
Available water capacity: About 10 inches
Shrink-swell potential: High

Contrasting Inclusions

- Darby, Dixonville, and Jory soils in convex positions
- Panther soils in concave positions and near drainageways
- Yoncalla soils that have slopes of more than 20 percent

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

- Wetness
- Hazards of compaction and erosion
- Steepness of slope
- High shrink-swell potential
- Very slow permeability
- Hazard of slope failure
- Low soil strength

Use and Management

Cropland

- Sprinkler and trickle irrigation systems are suited to this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
- Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
- Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate wetness.

Pasture

- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
- If a suitable outlet is available, tile drains can be used to divert subsurface water away from the absorption field.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- For the steeper areas of this unit, install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
- Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
- Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
- Slumping can be minimized by restricting the construction of roads and other activities that disturb the soil to the less sloping or more well drained areas and by using properly designed road drainage systems.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

275E—Yoncalla silty clay loam, 20 to 30 percent slopes

Composition

Yoncalla soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Hills
Landscape position: Footslopes and alluvial fans
Parent material: Colluvium derived from basalt
Elevation: 350 to 2,000 feet
Native plants: Oregon white oak and Pacific madrone with an understory of Pacific poison oak, rose, blue wildrye, and California oatgrass

Climatic factors:
Mean annual precipitation—30 to 55 inches
Mean annual air temperature—50 to 55 degrees F
Frost-free period—160 to 235 days

Typical Profile

0 to 8 inches—very dark grayish brown silty clay loam
8 to 15 inches—dark brown silty clay loam
15 to 49 inches—brown clay
49 to 60 inches—brown gravelly clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 6 to 30 inches in December through April
Permeability: Very slow
Available water capacity: About 10 inches
Shrink-swell potential: High

Contrasting Inclusions

• Darby, Dixonville, and Jory soils in convex, more steeply sloping positions
• Panther soils in concave positions and near drainageways
• Yoncalla soils that have slopes of less than 20 percent or more than 30 percent

Major Uses

Cropland, pasture, and homesite development

Major Management Limitations

• Steepness of slope
• Wetness
• Hazards of erosion and compaction
• High shrink-swell potential
• Very slow permeability
• Hazard of slope failure
• Low soil strength

Use and Management

Cropland

• Erosion can be minimized if fall grain is seeded early, conservation tillage is used, and tillage and seeding are on the contour or across the slope. Waterways should be shaped and seeded to perennial grass.
• Maintain fertility and tilth by returning crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
• Select plants that can tolerate wetness.

Pasture

• Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
• Chisel or subsoil to break up compacted layers.
• Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

• Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
• In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
• Stockpile topsoil for use in reclaiming areas disturbed during construction.
• Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
• Interceptor ditches can be used to divert subsurface water away from the absorption field.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• Install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
• Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• Slumping can be minimized by restricting the construction of roads and other activities that disturb the soil to the less sloping or more well drained areas and by using properly designed road drainage systems.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

276E—Zalea-Pyrady complex, 15 to 30 percent slopes

Composition

Zalea soil and similar inclusions—60 percent
Pyrady soil and similar inclusions—25 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Ridges
Parent material: Colluvium and residuum derived from metamorphic rock
Elevation: 3,400 to 4,000 feet
Native plants: Douglas fir and golden chinkapin with an understory of salal, cascade Oregongrape, Pacific rhododendron, and western swordfern
Climatic factors:
Mean annual precipitation—85 to 90 inches
Mean annual air temperature—42 to 45 degrees F
Frost-free period—60 to 100 days

Zalea Soil

Typical profile

0 to 8 inches—dark brown gravelly loam
8 to 16 inches—dark yellowish brown gravelly clay loam
16 to 34 inches—light olive brown gravelly clay loam
34 inches—hard bedrock

Properties and qualities

Depth to hard bedrock: 20 to 40 inches
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 5 inches

Pyrady Soil

Typical profile

0 to 6 inches—dark brown clay loam
6 to 21 inches—dark brown and olive brown gravelly clay loam
21 to 43 inches—olive and dark gray gravelly silty clay
43 to 60 inches—olive gray gravelly clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Moderately well drained
Permeability: Slow
Available water capacity: About 8.5 inches
Depth to water table: 24 to 60 inches in November through May
Shrink-swell potential: High

Contrasting Inclusions

- Acker soils, high elevation
- Atring soils, high elevation, in convex, more steeply sloping positions
- Zalea and Pyrady soils that have slopes of less than 15 percent or more than 30 percent

Major Use

Woodland

Major Management Limitations

Zalea and Pyrady

- Hazards of erosion and compaction
- Steepness of slope
- Plant competition

Zalea

- Moderately slow permeability
- Hazard of windthrow
- Depth to rock

Pyrady

- Slow permeability

Use and Management

Woodland

- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees on the Zalea soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

277E—Zing loam, 0 to 30 percent slopes

Composition

Zing soil and similar inclusions—85 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Footslopes and concave side slopes
Parent material: Residuum and colluvium derived from granodiorite, volcanic rock, and metamorphic rock
Elevation: 1,000 to 3,500 feet
Native plants: Douglas fir with an understory of salal, cascade Oregongrape, western swordfern, and common snowberry
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Typical Profile

0 to 7 inches—dark brown loam
7 to 10 inches—dark brown clay loam
10 to 17 inches—dark yellowish brown clay
17 to 60 inches—gray and light olive gray clay

Soil Properties and Qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 24 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Acker and Norling soils in convex, more steeply sloping positions
- Dumont, Lettia, and Sweetbriar soils in convex, more steeply sloping positions
- Soils that are similar to this Zing soil but are poorly drained and are in concave positions and near drainageways
- Zing soils that have slopes of more than 30 percent

Major Uses

Woodland, hay and pasture, and homesite development

Major Management Limitations

- Wetness
- Hazards of erosion and compaction
- Plant competition
- Steepness of slope
- Hazard of slope failure
- High shrink-swell potential
- Slow permeability
- Low soil strength
- Hazard of windthrow
- Hazard of fire damage

Use and Management

Woodland

- Because the soil in this unit is unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soil less.
- Using low-pressure ground equipment minimizes damage to the soil and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soil is least susceptible to compaction.
- When the soil is dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soil.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Increased erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Hay and pasture

- Sprinkler and trickle irrigation systems are suited to the less sloping areas of this unit. The method used generally is governed by the crop grown.
- Apply enough water to wet the root zone but not so much that it leaches plant nutrients.
- Regulate the application of irrigation water to prevent a rise in the level of the water table and to control runoff and erosion.
- Maintain fertility and tilth by returning crop residue to

the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- Select plants that can tolerate wetness.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.
- Alternative waste disposal systems may function properly on this soil. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
- If a suitable outlet is available, tile drains can be used to divert subsurface water away from the absorption field.
- Increase the size of the septic tank absorption field to compensate for the restricted permeability.
- For the steeper areas of this unit, install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
- Roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
- Prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
- Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
- Slumping can be minimized by restricting the construction of roads and other activities that disturb the soil to the less sloping or more well drained areas and by using properly designed road drainage systems.
- Build roads in the less sloping areas of the unit to minimize cuts and fills.
- Seed cuts and fills to permanent vegetation.

278E—Zing-Lettia complex, 3 to 30 percent slopes

Composition

Zing soil and similar inclusions—60 percent
Lettia soil and similar inclusions—25 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Zing—footslopes and concave side slopes; Lettia—footslopes and convex side slopes
Parent material: Residuum and colluvium derived from granodiorite
Elevation: 1,000 to 3,500 feet
Native plants: Douglas fir with an understory of salal, cascade Oregongrape, western swordfern, and common snowberry
Climatic factors:
Mean annual precipitation—40 to 55 inches
Mean annual air temperature—45 to 52 degrees F
Frost-free period—100 to 180 days

Zing Soil

Typical profile

0 to 7 inches—dark brown loam
7 to 10 inches—dark brown clay loam
10 to 17 inches—dark yellowish brown clay
17 to 45 inches—gray clay
45 to 62 inches—light olive gray clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 24 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Lettia Soil

Typical profile

0 to 12 inches—dark brown gravelly loam
12 to 16 inches—strong brown loam
16 to 58 inches—strong brown clay loam
58 inches—soft bedrock

Properties and qualities

Depth to soft bedrock: 40 to 60 inches
Drainage class: Well drained

Permeability: Moderately slow
Available water capacity: About 8 inches

Contrasting Inclusions

- Acker, Dumont, and Norling soils underlain by metamorphic rock
- Sharpshooter and Threeforks soils underlain by mica schist
- Dompier soils in concave positions
- Steinmetz soils in more steeply sloping positions
- Sitkum soils in convex, more steeply sloping positions
- Zing and Lettia soils that have slopes of more than 30 percent

Major Uses

Woodland, hay and pasture, and homesite development

Major Management Limitations

Zing and Lettia

- Hazards of erosion and compaction
- Hazard of slope failure
- Plant competition
- Steepness of slope
- Hazard of fire damage

Zing

- Wetness
- Slow permeability
- High shrink-swell potential
- Low soil strength
- Hazard of windthrow

Lettia

- Seedling mortality
- Moderately slow permeability

Use and Management

Woodland

- Because the Zing soil is unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Avoiding very wet areas, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Increased erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Trees on the Zing soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Hay and pasture

- Maintain fertility and tilth by returning crop residue to the soils and using a cropping system that includes grasses, legumes, or grass-legume mixtures.
- In areas of the Zing soil, select plants that can tolerate wetness.
- Reduce the risks of compaction of the surface layer and erosion by planning grazing systems, using proper stocking rates, and limiting grazing and field operations to drier periods.
- Tillage and seeding should be done on the contour or across the slope where practical.
- Chisel or subsoil to break up compacted layers.
- Cross-fencing, water developments, and placement of salt improve livestock distribution.

Homesite development

- Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.
- In the steeper areas, reduce the risk of erosion by disturbing only the construction site.
- Stockpile topsoil for use in reclaiming areas disturbed during construction.

• Alternative waste disposal systems may function properly on this unit. Areas of included soils may be suitable for standard waste disposal systems; however, onsite investigation is needed to locate these areas.
• Interceptor ditches can be used to divert subsurface water away from the absorption field.
• Increase the size of the septic tank absorption field to compensate for the restricted permeability.
• For the steeper areas of this unit, install septic tank absorption lines on the contour or in adjacent areas that are more nearly level.
• Roads on the Zing soil should be designed to offset the effects of shrinking and swelling and the limited ability of the soil to support a load.
• On the Zing soil, prevent structural damage that results from shrinking and swelling by backfilling with material that has low shrink-swell potential, properly designing foundations and footings, and diverting runoff away from buildings.
• Reduce wetness by installing drain tile around footings and providing drainage around buildings with basements and crawl spaces.
• Slumping can be minimized by restricting the construction of roads and other activities that disturb the soils to the less sloping or more well drained areas and by using properly designed road drainage systems.
• Build roads in the less sloping areas of the unit to minimize cuts and fills.
• Seed cuts and fills to permanent vegetation.

279E—Zing-Sweetbriar complex, 3 to 30 percent slopes

Composition

Zing soil and similar inclusions—65 percent
Sweetbriar soil and similar inclusions—25 percent
Contrasting inclusions—10 percent

Setting

Landform: Mountains
Landscape position: Zing—concave side slopes; Sweetbriar—ridges and convex side slopes
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 800 to 2,400 feet
Native plants: Douglas fir with an understory of salal, cascade Oregongrape, western swordfern, and common snowberry
Climatic factors:
Mean annual precipitation—45 to 55 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 160 days

Zing Soil

Typical profile

0 to 7 inches—dark brown loam
7 to 10 inches—dark brown clay loam
10 to 17 inches—dark yellowish brown clay
17 to 60 inches—gray and light olive gray clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 24 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Sweetbriar Soil

Typical profile

0 to 8 inches—very dark grayish brown silty clay loam
8 to 18 inches—dark brown clay
18 to 38 inches—dark yellowish brown clay
38 to 60 inches—yellowish brown and dark yellowish brown silty clay loam and clay loam

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

• Soils that are similar to the Sweetbriar soil but have bedrock at a depth of less than 40 inches and are in convex, more steeply sloping positions
• Zing and Sweetbriar soils that have slopes of more than 30 percent

Major Use

Woodland

Major Management Limitations

Zing and Sweetbriar

• Hazards of compaction and erosion
• Hazard of slope failure
• Plant competition
• Steepness of slope
• High shrink-swell potential
• Low soil strength

Zing

- Wetness
- Slow permeability
- Hazard of windthrow
- Hazard of fire damage

Sweetbriar

- Moderately slow permeability

Use and Management

Woodland

- Because the Zing soil is unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used, but cable yarding generally is safer in the more steeply sloping areas and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Increased erosion, loss of nutrients, and water repellency are likely to result from fires of moderate intensity.
- Avoiding very wet areas, planting larger trees or a higher number of trees in a specified area, and selecting climatically adapted seedlings help to ensure the establishment and survival of seedlings.
- Trees on the Zing soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

279F—Zing-Sweetbriar complex, 30 to 60 percent slopes

Composition

Zing soil and similar inclusions—60 percent
Sweetbriar soil and similar inclusions—25 percent
Contrasting inclusions—15 percent

Setting

Landform: Mountains
Landscape position: Zing—concave side slopes of less than 45 percent; Sweetbriar—convex side slopes
Parent material: Residuum and colluvium derived from volcanic rock
Elevation: 1,000 to 3,000 feet
Native plants: Douglas fir with an understory of salal, cascade Oregongrape, western swordfern, and common snowberry
Climatic factors:
Mean annual precipitation—45 to 55 inches
Mean annual air temperature—47 to 52 degrees F
Frost-free period—120 to 160 days

Zing Soil

Typical profile

0 to 7 inches—dark brown loam
7 to 10 inches—dark brown clay loam
10 to 17 inches—dark yellowish brown clay
17 to 60 inches—gray and light olive gray clay

Properties and qualities

Depth to bedrock: 60 inches or more
Drainage class: Somewhat poorly drained
Depth to water table: 24 to 36 inches in November through May
Permeability: Slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Sweetbriar Soil

Typical profile

0 to 8 inches—very dark grayish brown silty clay loam
8 to 18 inches—dark brown clay
18 to 38 inches—dark yellowish brown clay
38 to 60 inches—yellowish brown and dark yellowish brown silty clay loam and clay loam

Properties and qualities

Depth to bedrock: 60 inches or more

Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: About 10.5 inches
Shrink-swell potential: High

Contrasting Inclusions

- Soils that are similar to the Sweetbriar soil but have more than 35 percent rock fragments or have bedrock at a depth of less than 40 inches and are in convex, more steeply sloping positions
- Rock outcrop in convex positions
- Zing and Sweetbriar soils that have slopes of less than 30 percent
- Sweetbriar soils that have slopes of more than 60 percent

Major Use

Woodland

Major Management Limitations

Zing and Sweetbriar

- Hazards of erosion and compaction
- Steepness of slope
- Hazard of slope failure
- Plant competition
- High shrink-swell potential
- Low soil strength

Zing

- Wetness
- Slow permeability
- Hazard of windthrow

Sweetbriar

- Moderately slow permeability

Use and Management

Woodland

- Because the Zing soil is unsuited to traffic when wet, use equipment only during dry periods.
- Wheeled and tracked equipment can be used in the less sloping areas, but cable yarding generally is safer and disturbs the soils less.
- Using low-pressure ground equipment minimizes damage to the soils and helps to maintain productivity.
- Reduce the risk of erosion by seeding roads, roadcuts, roadfills, skid trails, and landings and by installing water bars.
- Proper design of road drainage systems and care in the placement of culverts help to control erosion.
- To reduce the risk of compaction, use suitable logging systems, lay out skid trails in advance, and harvest timber when the soils are least susceptible to compaction.
- When the soils are dry, landings and skid trails can be ripped to improve plant growth.
- This unit is susceptible to slope failure; therefore, onsite investigation may be needed before disturbing the soils.
- Slumping can be minimized by locating roads in the less sloping or more well drained areas and by using properly designed road drainage systems.
- Undesirable plants limit natural or artificial reforestation unless intensive site preparation and maintenance are used.
- Mulching around seedlings helps to reduce competition from undesirable understory plants and helps to retain moisture in summer.
- Trees on the Zing soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Rodney McCoy, Douglas County extension agent, Oregon State University, helped to prepare this section.

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed, the system of land capability classification used by the Natural Resources Conservation Service is explained, and prime farmland is described.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading “Detailed Soil Map Units.” Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Douglas County has a total area of 3,240,320 acres, of which 2,259,471 acres are included in the survey area. According to the 1987 Census of Agriculture, farms comprise 438,087 acres (USDC, 1987). Of this, 38,654 acres are harvested and 13,760 acres are irrigated. The 1991 National Resource Inventory determined that there were 218,551 acres of pasture on upland hills.

The soils and climate of the flood plains and terraces are well suited to the production of alfalfa, grass-legume hay, and row crops. On the uplands, however, the soils and the limited availability of irrigation water restrict production to hay and permanent pasture.

The soils and climate of the survey area are excellent for growing forage crops. The growing season is long, and the cool, wet spring is ideal for clover and ryegrass pasture. In summer, however, this pastureland may not receive sufficient moisture. Rainfall in July and August is less than 0.5 inch per month, which limits forage production.

Hayland and pastureland in the survey area can be divided into three types based on management and physiography of the soils. They are the well drained or moderately well drained flood plains and terraces that are irrigated or subirrigated; the somewhat poorly drained or poorly drained terraces, footslopes, or alluvial fans; and the upland pastures.

The acreage of the bottomland soils in the survey area is small, but the soils are suited to a wide variety of crops. Examples of productive, deep, well drained or moderately well drained bottomland soils are those of the Malabon, Coburg, Roseburg, and Foehlin series. If irrigated, these soils produce high yields of alfalfa and improved pasture. They can also be used to grow alternative crops such as vegetables. In some parts of the survey area, grapes are grown on the bottomland soils. These soils produce very large, dense canopies of grapes that must be managed with appropriate trellises and pruning methods to produce top-quality fruit.

The somewhat poorly drained and poorly drained soils produce lower yields of sub-clover and ryegrass hay and pasture. These soils stay wet well into spring, and as a result, much of the harvested hay is overmature. Grazing early in spring and harvesting grass-legume hay early in summer improve the quality of the hay and pasture but reduce the quantity. Examples of these soils are those of the Conser, Pengra, and Waldo series.

The upland pastures are very productive and extensive. The grass-legume pastures support a productive livestock enterprise in the survey area. Examples of upland soils used for pasture are those of the Oakland, Dixonville, and Philomath series. Although these soils are moderately deep or shallow, they are fertile. They are on gentle and moderate slopes as well as slopes that are too steep for mechanical harvesting. Some of the south-facing upland pastures are being converted to vineyards.

Most of the soils used for hay and pasture are strongly acid or very strongly acid unless lime is applied. Some of the well drained bottomland soils are slightly acid. Applications of lime are needed for these soils to produce optimum yields of alfalfa and pasture. Because most of the soils have insufficient phosphorous and sulfur for adequate production, these elements should also be applied.

Additions of lime and fertilizer should be based on the results of soil tests and on the needs of the crop grown. The Cooperative Extension Service can assist in determining the proper kind and amount of fertilizer and lime to apply. The latest information on adapted varieties and seeding recommendations can be obtained from the local office of the Cooperative Extension Service or the Natural Resources Conservation Service. Information on proper design of drainage and irrigation systems for each kind of soil is available at the local office of the Natural Resources Conservation Service.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of map units in the survey area also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Yields for wine grapes were based on present grape production. It may be feasible to grow grapes in areas of soils that are similar to those presently used for grape production, but yields are not available. Yields in table 5 are for nonirrigated Pinot Noir and Chardonnay varieties.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. Prunes and apples are examples of crops that contribute to the agricultural economy of the survey area but are grown on only a few soils; therefore, they are not included in the table. Both are high-value crops, and they generally are grown only on the better drained soils such as those of the Chapman, Evans, Newberg, and Roseburg series. Christmas trees are grown on the gentler slopes in areas of nearly all of the soils that are suited to the production of timber. The short growing season of the cold soils at high elevations in the Western Cascade Mountains (general soil map unit 25) limits the use of these soils for Christmas tree production. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for crops not shown in the table.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (USDA, 1961). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

All of the soils in the survey area have been assigned a capability classification for nonirrigated uses, but only the soils that typically are irrigated have been assigned a capability classification for irrigated uses. The capability classification is given in table 6.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation’s short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation’s prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

About 88,716 acres, or nearly 4 percent of the survey area, meet the requirements for prime farmland. The map units in the survey area that are considered prime farmland are listed in this section. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as wetness and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units." The map units that meet the requirements for prime farmland are:

1C Abegg very gravelly sandy loam, 2 to 12 percent slopes (if irrigated)
14A Banning loam, 0 to 3 percent slopes
14C Banning loam, 3 to 12 percent slopes
21C Bellpine silt loam, 3 to 12 percent slopes
22C Bellpine clay loam, 3 to 12 percent slopes
35A Central Point loam, 0 to 3 percent slopes
37A Chapman-Chehalis complex, 0 to 3 percent slopes
42B Coburg silty clay loam, 0 to 5 percent slopes
43A Coburg silty clay loam, flooded, 0 to 3 percent slopes
69C Dumont gravelly loam, 2 to 12 percent slopes
78A Evans loam, 0 to 3 percent slopes
81A Foehlin gravelly loam, 0 to 3 percent slopes
81C Foehlin gravelly loam, 3 to 12 percent slopes
83A Glide fine sandy loam, 0 to 3 percent slopes (if irrigated)
112A Jimbo-Haflinger complex, 0 to 3 percent slopes
113C Jory silty clay loam, 2 to 12 percent slopes
115C Josephine gravelly loam, 3 to 12 percent slopes
144A Malabon silty clay loam, 0 to 3 percent slopes
145A Malabon silty clay loam, flooded, 0 to 3 percent slopes
151A McNab clay loam, 0 to 3 percent slopes
154B Medford clay loam, 0 to 7 percent slopes
159C Nekia silty clay loam, 2 to 12 percent slopes
164A Newberg fine sandy loam, 0 to 3 percent slopes (if irrigated)
165A Newberg loamy sand, 0 to 3 percent slopes (if irrigated)
183B Packard gravelly loam, 0 to 5 percent slopes
184A Packard gravelly loam, flooded, 0 to 3 percent slopes
202B Redbell silt loam, 0 to 5 percent slopes (if drained)
214A Roseburg loam, 0 to 3 percent slopes
215C Rosehaven loam, 3 to 12 percent slopes
224B Sibold fine sandy loam, 0 to 5 percent slopes
255C Veneta loam, 0 to 12 percent slopes
262C Windygap silt loam, 2 to 12 percent slopes
263C Windygap clay loam, 2 to 12 percent slopes

Forest Management

By Craig Kintop, district silviculturalist, Bureau of Land Management, and Craig Ziegler, forester, Natural Resources Conservation Service.

The survey area is one of the primary timber-producing regions in Oregon. The city of Roseburg is recognized as the center for the forest products industry in the survey area. The local sawmills produce lumber, plywood, veneer, and wood chips for pulp and laminated plywood. The major managers of the forestland are the Bureau of Land Management, private companies, and individual landowners. Fire protection for the private land is provided by the Oregon State Department of Forestry and local fire districts. The Bureau of Land Management and the Forest Service provide fire protection for land that is administered by these agencies.

The silvicultural systems used by the individual landowners differ according to the management objectives. Silvicultural systems define the sequence of management practices that take place over the entire life of a forest stand. A silvicultural system consists of three phases—harvesting, regeneration (reforestation), and management of the stand. Because of the wide variety of forest types and site conditions in the survey area, actual practices used in each phase on a specific unit also vary. The value and quality of wood products should be considered in the design of silvicultural systems, which include proper rotation periods, regulation of stand density, and tree pruning. Reforestation is the most critical part of any silvicultural system. All silvicultural practices are regulated under various statutes, one of which is the Oregon Forest Practices Act (State of Oregon, 1991).

Currently, even-aged management silvicultural systems are used by landowners that manage the largest acreages. Some landowners use uneven-aged systems on all or part of their land. The even-aged systems commonly used in the survey area most closely resemble the classic silvicultural systems that apply the clearcut and shelterwood methods of harvesting (Smith, 1962).

Harvesting of stands under even-aged systems can occur at any time after the stand reaches a specified minimum age that has been set up to meet land use objectives and economic goals and has been determined is suitable for logging. On the best sites, harvesting can occur as early as when the stand is 30 years old, but it generally occurs later. Some owners harvest when the stand is near the culmination of the mean annual increment (CMAI). CMAI is affected by the quality of the site, the kinds of silvicultural practices used, and the timing of these practices. In areas where even-aged systems are used, CMAI can vary considerably but it generally is 75 to 110 years of age for merchantable trees (Curtis, 1992). Under even-aged systems, the entire stand generally is harvested except for a low number of designated green trees and snags that are retained to meet the requirements of the Oregon Forest Practices Act. Harvesting equipment commonly used includes crawler tractors and various cable yarding systems. Harvest units undergoing regeneration cuts can be as large as 120 acres in size. Stands managed under even-aged systems generally are reforested after harvest by planting conifer tree species suited to the specific site. The site commonly is prepared for planting by use of prescribed burning or other treatment to reduce logging debris and residual brush cover. Some large industrial and public landowners maintain genetic tree improvement programs and reforest with improved species that are expected to have superior growth qualities that result in increased timber yields. Retaining green trees in the harvest unit and adjacent timber stands can result in natural regeneration.

During the regeneration period, generally the first 5 years after harvest and reforestation, stand maintenance practices and thinning may be needed to ensure the survival and growth of the trees. These practices include control of competing vegetation and protection from animal damage. Vegetation can be controlled by a variety of methods including use of aerial- and ground-applied herbicides, mulching with various materials, and hand cutting of competing species. Animal damage can be minimized by placing rigid plastic tubes over the seedlings to protect individual trees from browsing animals and by hunting and trapping the animals.

After the regeneration phase, even-aged stands are treated primarily to produce higher timber yields. These treatments include control of species composition and stand density. Precommercial thinning ensures that growth is concentrated in selected trees, and it increases the opportunity for early commercial thinning harvests. Precommercial thinning generally is done when the regenerated stand is 10 to 20 years old. Commercial thinning removes trees that would otherwise die and decay before the final harvest. Commercial thinning is conducted at various ages depending on the productivity of the site, but generally it occurs when the stand is 30 to 70 years old. Fertilization can be used to temporarily increase stand growth. Fertilizer commonly is applied in conjunction with precommercial or commercial thinnings. Pruning can be used to increase the quality of the wood by encouraging the production of clear and even-grained logs (Fight and others, 1988).

In response to concerns about the protection of endangered species (USDI, FWS, 1992) and other environmental issues, some landowners are considering other silvicultural systems for managing forestland (Franklin, 1990; USDI, BLM, 1992). These systems are modifications of the more traditional systems. In these systems the main emphasis of management is shifted from timber production toward retention or re-creation of ecosystems that more closely resemble the natural ecosystems in composition, structure, and function. Retaining live trees, snags, and large-sized downed woody debris provides the initial structure and composition needed for development of the natural ecosystem.

Forest stands that result from the application of structural retention systems commonly are multiple-canopied and multiple-aged stands. These systems would most closely resemble the classic silvicultural systems that apply the irregular shelterwood and group selection methods of harvesting (Smith, 1962).

Table 7 summarizes the forestry information given in the detailed soil map unit descriptions and serves as a quick reference for forestland interpretations. The soils are rated for a number of factors to be considered in forest management. *Slight, moderate*, and *severe* indicate the degree of the major soil limitations. If a soil has a rating of moderate or severe, more information is given in the section “Detailed Soil Map Units.” Of the factors listed, soil erosion, seedling mortality, plant competition, compaction, and equipment limitations are of the greatest concern. A discussion of the factors to be considered in forest management follows.

Sheet and rill erosion

Sheet and rill erosion ratings indicate the risk of off-road soil loss following fire, grazing, or forest management activities that expose the soil. A rating of slight indicates that no particular erosion control measures are needed under ordinary conditions, moderate indicates that some erosion control measures are needed, and severe indicates that special precautions are needed to control erosion. Practices such as use of special harvesting systems or alternative site preparation techniques and timing may be needed.

The hazard of sheet and rill erosion is based on the amount and intensity of rainfall, plant cover recovery rate, soil erodibility (K factor), soil loss tolerance (T factor), and percent slope. Soil loss tolerance is the maximum annual rate of soil erosion that can occur without affecting plant growth.

Cut and fill slope erosion

The majority of the soil in the survey area is on slopes of more than 30 percent. Because of the steepness of slope, construction and maintenance of roads is needed for forestland management. Cut and fill slope erosion ratings indicate the risk of soil loss from road cuts and fills. Dry ravel is not considered in the ratings. All cut and fill slopes should be seeded. Practices other than seeding that may be needed to reduce the risk of slope erosion include the use of mulch and sediment traps. A rating of slight indicates that no other preventative measures are needed under ordinary conditions, moderate indicates that other erosion control measures are needed only under certain conditions, and severe indicates that other erosion control practices are needed under most conditions.

The hazard of cut and fill slope erosion is based on the amount and intensity of rainfall, soil erodibility (K factor) of the exposed horizons, and the angle and length of the slope. The hazard increases in severity as the cut and fill slopes increase in length and as the weighted K factor value increases.

Equipment limitation

Equipment limitation ratings indicate the difficulty of off-road use of wheeled or tracked, ground-based equipment as a result of soil, topographic, or climatic characteristics.

A rating of slight indicates that equipment use may be restricted by soil wetness for a period of as long as 3 months in a normal year. Normally, the kind of equipment and the season of use are not restricted by site features. A rating of moderate indicates that equipment use is limited by one or more site features. Use is restricted by slope, stones, soil wetness, soil instability, or soil texture (clayey or sandy), or by a combination of two or more of these features. In areas where soil wetness is a factor, equipment use is restricted for a period of 3 to 6 months in a normal year. A rating of severe indicates that the kind of equipment that can be used or the season of use is severely restricted by one or more site features. In areas where soil wetness is a factor, equipment use is restricted for a period of more than 6 months in a normal year. Selection of the proper equipment and proper timing of operations are needed to minimize seasonal limitations.

Trafficability, soil-related physical limitations, steepness of slope, and soil wetness are the main factors that limit the use of equipment. As slope gradient and length increase, wheeled equipment is more difficult to use; tracked equipment should be used on the steeper slopes. Use of both wheeled and tracked equipment is impractical on the steepest slopes. Soil wetness, especially in areas of fine-textured soils, can severely limit the use of equipment and make harvesting practical only when the soil is dry or frozen. Extreme soil textures commonly affect the use of equipment; organic material, clay, and loose sand can all affect trafficability. Boulders and stones may also limit the use of equipment.

Soil compaction

Soil compaction reduces the growth of trees and roots by limiting the infiltration of water and air into the soil. Compaction ratings indicate the risk that damage to the soil structure will occur as a result of the use of equipment during periods when the soil is wet or moist. A rating of slight indicates that no special equipment is needed and the season of use generally is not restricted; moderate indicates that there may be some seasonal restrictions to the use of ground equipment and the use of cable yarding may be advisable; and severe indicates the need for extreme caution in the use of equipment and some restorative practices, such as ripping or disking, may be needed after harvesting.

The risk of compaction should always be considered during silvicultural activities. Use of designated skid trails and protection of the duff layer help to minimize damage to the soil. A rating of moderate or severe indicates the need to select the proper equipment and the proper season of use.

Surface texture, coarse fragment content, and plasticity are soil characteristics considered in the compaction hazard rating. The rating assumes that the soil is wet or moist. Soil compaction decreases air spaces in the soil, reducing the movement of air and water, and thus restricting root growth and increasing the risk of surface erosion.

Soil displacement

Soil displacement ratings indicate the risk of gouging, scraping, or pushing the soil from its natural position by the use of equipment. Displacement is most often associated with mechanical slash disposal, tractor yarding operations, and site preparation.

A rating of slight indicates that the use of equipment is not restricted. Special precautions generally are not needed. Moderate indicates that the use of specialized equipment, such as a brush rake, is recommended for mechanical slash disposal, site preparation, and other activities that disturb the soil. Severe indicates that extreme caution is advised when the soil is disturbed.

If soil displacement is a risk, soil-disturbing activities such as mechanical slash disposal and site preparation should be closely monitored or alternative methods should be used. In areas where excessive soil displacement has occurred, plant recovery rates may be impaired. Prolonged exposure of barren soil may result in an increased risk of erosion and further deterioration of the site.

The surface texture of the soil and the amount of rock fragments in the upper 12 inches influence how readily the soil will hold together when pushed by ground machinery or skidding logs. Slope is also a factor because more maneuvering of machinery is needed as the slopes become steeper. Soil moisture is assumed to be at field capacity or drier.

Seedling mortality

Seedling mortality ratings indicate that the risk of death of natural or planted tree seedlings as a result of soil or topographic characteristics. Plant competition and damage by animals are not considered in the rating. The rating applies to naturally occurring seedlings and to healthy, dormant bare-root or containerized seedlings from good stock that are properly planted during a period of sufficient moisture.

A rating of slight indicates that mortality is not a concern under normal conditions; moderate indicates that some mortality can be expected and extra precautions are advised; and severe indicates that the rate of mortality will be high and extra precautions are essential for successful reforestation. If seedling mortality is a concern, it may be necessary to use larger than normal planting stock, special site preparation, surface drainage, or reinforcement plantings.

Seedling mortality is affected by soil chemistry, soil drainage, the available water capacity of the soil, the temperature and moisture regimes, and the steepness and aspect of the slope. Soil chemistry influences the amount and kind of nutrients available to plants and affects the availability of soil water. Soil drainage affects the degree, frequency, and duration of soil wetness. The amount of water in the soil that is available for plant use is determined by the available water capacity of the soil and the effective rooting depth. The amount of water held in the upper 20 inches, or the effective rooting depth, is an indicator of droughtiness. Seedlings can survive in areas of soils that have a low available water capacity if the frequency and duration of precipitation is favorable. On the steep, south-facing slopes of the Interior and Klamath Mountains, the high temperatures and rate of evaporation significantly increase seedling mortality.

Windthrow

Windthrow ratings indicate the risk of trees being tipped over and partially or fully uprooted by strong winds during periods when the soil is moist or wet. A rating of slight indicates that trees normally are not blown down by wind; moderate indicates that an occasional tree may be blown down during periods when the soil is wet and winds are moderate or strong; and severe indicates that many trees may be blown down during periods when the soil is wet and winds are moderate or strong. If the windthrow rating is moderate or severe, care in harvesting and thinning of forest stands is needed. Use of seed tree systems or regeneration with isolated single trees or groups of trees is not practical. Periodic salvage of windblown trees may be needed. An adequate road and trail system to allow for salvage operations should be maintained.

Considered in the rating are soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. Rooting depth may be restricted as a result of a high water table, underlying bedrock, or an impervious layer. Loose soil may result in poor anchoring of roots.

Plant competition

Plant competition ratings indicate the likelihood of the invasion of plants to a level sufficient to delay or prevent establishment of adapted tree seedlings. A rating of slight indicates that plants have little or no effect on the establishment and development of seedlings, moderate indicates that uncontrolled competition from understory vegetation may retard natural or planted reforestation but will not prevent the eventual development of a fully stocked stand; and severe indicates that competition from understory vegetation can be expected to prevent natural or planted reforestation. A rating of moderate or severe indicates the need for careful and thorough site preparation and the potential need for mechanical or chemical treatment to retard growth of competing vegetation. Reforestation should be completed as soon as possible after harvesting.

Climate and soil characteristics affect plant competition. In many areas, plant competition concerns can be predicted by determining the quantity and proximity of seed sources of undesirable plants or the quantity of unwanted brush rootstock that will resprout after harvesting. The most common competitors are tanoak, red alder, Pacific madrone, Oregon white oak, salal, rhododendron, Pacific poison oak, and huckleberry.

Fire damage

Fire damage ratings indicate the risk that a fire of moderate fireline intensity (116 to 520 btu/sec/ft), which is likely to occur in a clearcut slash burn, will have a negative affect on soil nutrients and on the physical and biotic characteristics of the soil. A rating of slight indicates that negative impacts to soil characteristics are not expected from fires of moderate fireline intensity; moderate indicates that negative impacts, such as hydrophobicity and excessive erosion, may occur and extra caution is advised in planning prescribed fires; and severe indicates that negative impacts are likely to occur and extreme caution is advised in planning prescribed fires.

Combustion of organic matter volatilizes nutrients, reduces soil organic matter, and in some soils, increases water repellency. Populations of some soil organisms are at least temporarily reduced by the initial high soil temperatures and by subsequent changes in the chemical and physical properties of the soil. It may be necessary to burn in winter, use alternate lighting techniques, monitor fuel moisture content, yard unmerchantable material (YUM), eliminate prescribed burns, or apply erosion control measures following burning.

Fire damage ratings are based on the thickness of the surface mineral horizon, slope, soil texture and content of coarse fragments, and content of organic matter. Soils that have a shallow surface layer may lack the capacity to absorb the effects of fire. The recovery rate of these soils may be slower. Soils on steeper slopes are more likely to erode if the protective layer of duff is burned off. Texture affects the erodibility of the soil, the plant recovery rate, and the productivity of the soil. Coarse-textured soils transmit heat to a greater depth in a shorter period of time and are more prone to becoming water repellent. Soils that have a high content of gravel or stones respond to fire in much the same way as coarse-textured soils. Medium-textured soils inherently have a higher available water capacity, are likely to be cooler, and have a higher potential productivity. Soils that have less than 2 percent organic matter content usually recover at a slow rate. Soils that are high in organic matter content generally are more resistant to sheet and rill erosion. Also, these soils have a higher available water capacity and are more likely to be cooler for longer periods during the year.

Forest Productivity

Soil surveys are important to forestland managers as they seek ways to increase productivity. During the survey, foresters made numerous site index measurements. Plots were selected to determine productivity by detailed soil map unit and soil type. For some map units and soil types, adequate plots for measuring site index were not observed or could not be located. For these map units and soil types, site index and productivity values were estimated based on soil characteristics and associated measurements of similar soils in the survey area. The values that were estimated are identified in table 8 under the headings “Site index (50-year)” and “Site index (100-year).”

Table 8 summarizes the potential productivity of common trees on a soil. Potential productivity is based on site index. Site index is determined by measuring the height and age of selected trees within stands of a given species. The procedure used is given in the site index publications for ponderosa pine (Meyer, 1961), grand fir and white fir (Schumacher, 1926), Douglas-fir (King, 1966; McArdle and others, 1961), western hemlock (Barnes, 1962; Wiley, 1970), Sitka spruce (Meyer, 1937), and Pacific silver fir (Hoyer and Herman, 1989). The site index is based on fully stocked, even-aged stands. The highest timber yields can be expected from map units that have the highest site index. Site index values are converted to estimated yields at various ages by carefully using the appropriate yield tables.

Common trees are listed in the table in the order of abundance as observed on the map unit. Species preferred for wood production are planted for reforestation or are allowed to regenerate naturally. The recommended trees to plant for reforestation are identified in table 8 under the heading “Common trees.” Commercial value, topographic position, survival and growth potential, and natural plant community relationships are some of the factors that can influence the choice of adapted species for reforestation.

Recreation

Jeff Powers, Douglas County parks director, helped to prepare this section.

From the rugged Pacific Ocean coastline to the snow-capped Cascade Mountains, the survey area offers compeling scenery and diverse recreation opportunities (fig. 16). The Oregon Coast offers offshore sports, such as deep-sea fishing, boating, and windsurfing at Salmon Harbor, and there are numerous campgrounds, fishing streams, and hiking trails along the coastline. In addition to these activities, the Oregon Dunes National Recreation Area provides opportunities for riding dune buggies and all-terrain vehicles. Five miles east of Reedsport, the Bureau of Land Management has erected the Dean Creek Interpretive Center for viewing indigenous herds of Roosevelt elk.

The interior valleys of the survey area offer excellent opportunities for fishing for steelhead and other trout, salmon, and bass along the streams and for hunting of small game and waterfowl, and they provide numerous swimming and picnic areas. Within the interior valleys are two large reservoirs that are stocked with fish and offer opportunities for water-skiing.

The mountainous areas of the survey area, including the Klamath Mountains, Coast Range Mountains, and Western Cascade Mountains, provide opportunities for hunting of big game and upland birds and for camping and hiking.

Public land available for recreation activities includes the Elliott State Forest, Siuslaw National Forest, and Umpqua National Forest. Upon request, major timber companies in the survey area may permit access to their land for hunting, fishing, and camping. The highest elevations of the Western Cascade Mountains offer opportunities for winter sports such as cross-country skiing, snowmobiling, and fishing in the high lakes.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

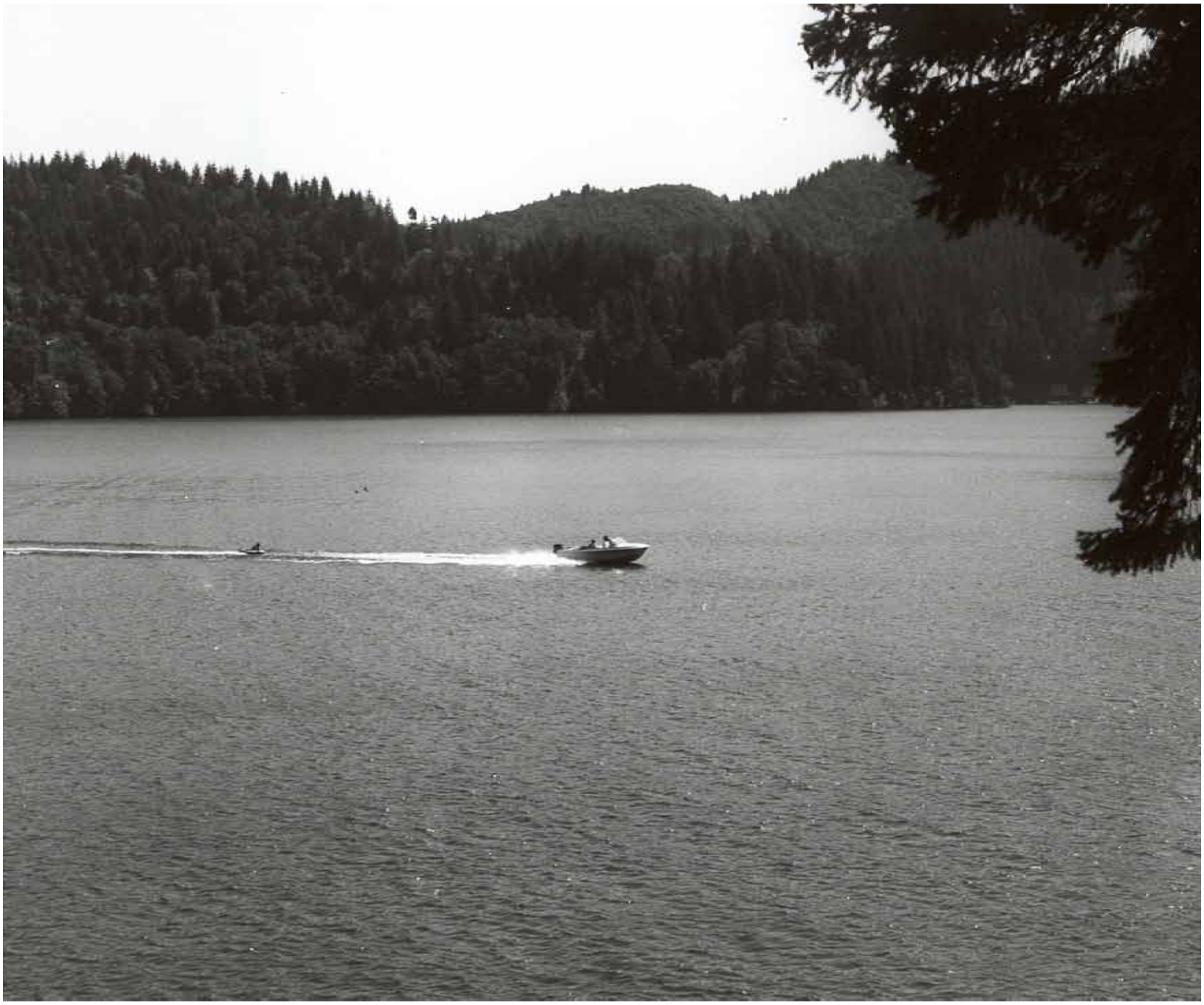


Figure 16.—Boating on Loon Lake in the Coast Range Mountains.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Steven Denney and Dave Loomis, biologists, Oregon Department of Fish and Wildlife, helped to prepare this section.

The soils and waterways of the survey area provide habitat for many fish and wildlife species. Diverse climatic conditions, plant communities, topography and landforms, rocks and minerals, and land uses across three converging physiographic provinces provide a wide variety of wildlife habitat (Franklin and Dyrness, 1973). These physical and biological factors can be used to separate and group habitat that supports unique communities of fish and wildlife.

With the general soil map as a reference, the wildlife habitat in the survey area has been separated into geographic groups. In the following paragraphs, information on the habitat in each group is provided and the threatened and endangered fish and wildlife species in each group are listed. Wildlife habitat throughout the survey area generally can be improved by use of agricultural and herbaceous plantings and by proper management of existing vegetation.

Group 1—Barren and stabilized dunes and eolian sand (general soil map unit 1). This group consists of barren shifting dunes, stabilized vegetated dunes, interdunal swales, and deflation basins along the Pacific Ocean. The native vegetation is characterized by shore pine, Sitka spruce, salal, evergreen huckleberry, coast willow, waxmyrtle, strawberry, eveningprimrose, and introduced European beachgrass.

In areas where suitable cover exists, the major wildlife species include black-tailed deer, raccoon, gophers, moles, striped skunk, and coyote. Bird species are abundant, especially migratory and resident shore birds, migratory waterfowl, songbirds, and raptors. Waterfowl and shore birds use the ponded deflation basins as resting and feeding areas.

Fish species include cutthroat trout and warmwater species. Productivity is relatively low, however, because of the lack of cover and warm water.

Threatened and endangered species in this group include bald eagle, brown pelican, western snowy plover, and Aleutian Canada goose. Sensitive areas include great blue heron rookeries and bald eagle and osprey nesting sites.

Group 2—Soils near perennial streams, rivers, and lakes (general soil map units 2, 4, and 5). This group consists of dominantly alluvial soils on flood plains, marine terraces, stream terraces, alluvial fans, and toeslopes. The very poorly drained to somewhat poorly drained soils generally support hydrophytic plants, and the moderately well drained to excessively drained soils generally support various grasses and hardwoods. The riparian vegetation along the streams and rivers should be protected from excessive disturbance to maintain or improve the quality of the water.

Major wildlife species in this group include black-tailed deer, beaver, river otter, mink, raccoon, bobcat, and coyote. This group provides important breeding habitat and travel corridors for waterfowl such as Canada geese, wood ducks, mallards, and mergansers; raptors such as bald eagle, osprey, and red-tailed hawk; amphibians such as salamanders and frogs; and reptiles such as western pond turtle.

Fish species include Chinook salmon, coho salmon, steelhead trout, cutthroat trout, smallmouth bass, Umpqua squawfish, coarsescale sucker, lamprey, dace, sturgeon, striped bass, shad, and Umpqua chub, which is classified as a sensitive species. The aquatic habitat associated with the soils in this group is very important for the natural production of fish species. The plant cover stabilizes the banks of streams and rivers, reduces water temperatures, and minimizes the deposition of sediment in streams and rivers.

Threatened and endangered species include bald eagle, which use areas in this group for feeding and nesting. Sensitive areas include osprey and bald eagle nesting sites and great blue heron rookeries.

Group 3—Soils on hills that support grassy oak woodland (general soil map units 6, 7, and 11). This group consists of soils on hills in the interior Umpqua Valley. These soils support relatively open areas of grassy oak woodland. The native vegetation is characterized by Oregon white oak, California black oak, Pacific madrone, Pacific poison oak, wedgeleaf ceanothus, wild rose, hairy honeysuckle, bedstraw, and various grasses.

Major wildlife species in this group include black-tailed deer, scattered Roosevelt elk, cougar, coyote, gray fox, red fox, bobcat, ringtail cat, gray squirrel, California ground squirrel, raccoon, striped skunk, opossum, black-tailed jackrabbit, and a variety of small mammals and rodents. Bird species include wild turkey, mountain quail, valley quail, ring-necked pheasant, band-tailed pigeon, acorn woodpecker, red-tailed hawk, turkey vulture, American kestrel, and a number of owl, jay, woodpecker, and songbird species. Several species of reptiles, including Pacific rattlesnake, western kingsnake, California kingsnake, bullsnake, western fence lizard, and alligator lizard, use the habitat in this group.

Fish species in this group are similar to those in group 2, except that marine species such as striped bass, shad, and sturgeon are not present in this group. The stream habitat in this group is very important for salmonoids.

Columbian white-tailed deer, a Federal endangered species, inhabits areas of this group. Most of the population is within a triangle made up of the towns of Roseburg, Sutherlin, and Glide.

Group 4—Soils of the Coast, Interior, Klamath, and Western Cascade Mountains (general soil map units 3, 8 through 10, and 12 through 24). This group consists of soils in mountainous, forested areas in the northwestern, northern, and southern parts of the survey area. These areas encompass some of the most diverse and productive wildlife habitat in the survey area. A variety of conifer species dominate the forests, including Douglas fir, western hemlock, and western redcedar in the Coast and Western Cascade

Mountains; Douglas fir, grand fir, and incense cedar in the Interior Mountains; and Douglas fir, ponderosa pine, and incense cedar in the Klamath Mountains. Common hardwood species are Pacific madrone, bigleaf maple, and golden chinkapin.

Major wildlife species in this group include big game species such as Roosevelt elk, black-tailed deer, cougar, and black bear; furbearers such as raccoon, bobcat, coyote, ringtail cat, red fox, gray fox, and weasel; striped and spotted skunk; opossum; brush and black-tailed jackrabbit; and a variety of squirrels and rodents. Game birds include blue grouse, ruffed grouse, mountain quail, California quail, wild turkey, and band-tailed pigeon. A variety of woodpeckers, songbirds, and raptors also inhabit this group. Included among the raptor species are bald eagle, golden eagle, turkey vulture, peregrine falcon, red-tailed hawk, sharp-skinned hawk, Cooper's hawk, goshawk, American kestrel, and a number of owls, including pygmy, screech, long-eared, spotted, and great horned owl. The most common reptiles are garter snakes, Pacific rattlesnake, common kingsnake, California kingsnake, rubber boa, bullsnake, western fence lizard, alligator lizard, and sagebrush lizard.

Fish species in this group are generally the same as those listed for group 2. Marine fish species, including striped bass, shad, and sturgeon, are in the Coast Mountains (general soil map units 3, 19, 20, 21, and 22), where habitat is very important to natural production. The Western Cascade Mountains (general soil map units 23 and 24) provide a major production area for fisheries.

Threatened and endangered species include bald eagle, peregrine falcon, and northern spotted owl.

Group 5—Cold, high-elevation soils of the Western Cascade Mountains (general soil map unit 25). This group consists of soils in the colder, higher elevation areas of the Western Cascade Mountains. The native vegetation is characterized by Douglas fir, western white pine, western hemlock, Pacific rhododendron, salal, cascade Oregongrape, western swordfern, Oregon oxalis, and beargrass. Pacific silver fir is in the coldest areas.

Many of the same wildlife species, including elk, black-tailed deer, cougar, bobcat, coyote, and weasel, that inhabit the lower elevation areas of the Western Cascade Mountains are also present in this areas. The higher elevation areas also provide habitat for mule deer, Cascade fox, pine marten, fisher, and wolverine. Snowshoe hares and pikas are numerous in areas of talus.

Game bird species are limited to ruffed grouse and blue grouse. A variety of owl species are at the higher elevations, including great horned owl, great gray owl, and boreal owl. Several woodpecker species inhabit these areas, including black-backed woodpecker, which is unique to these areas. A variety of small birds such as nuthatches, finches, and jays are also in these areas.

Though the specific productivity of fisheries in the higher elevation areas generally is less than that of downstream areas, overall productivity of fisheries in the Umpqua Basin is dependent on the temperature and flow of water from the higher elevation areas. Non-marine species in the higher elevation areas include brown trout, brook trout, and kokanee.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, or other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 11 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

The table also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

The table gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in the table are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading “Soil Series and Their Morphology.”

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. “Loam,” for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, “gravelly.” Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2001; PCA, 1973) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2000; PCA, 1973). Another reference used is the National Engineering Handbook (Available at the State office of the Natural Resources Conservation Service, Portland, Oregon).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^1/_3$-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on the basis of measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, more than 6 percent; and *very high*, greater than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.64. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In the table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

The table gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). *Common* is used when the occasional and frequent classes are grouped for certain purposes. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in the table are the depth to the seasonal high water table; the kind of water table—that is, perched, apparent, or artesian; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in the table.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone. An *artesian* water table is under hydrostatic head, generally below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. “More than 6.0” indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1975 and 1992). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 17 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Xerult (*Xer*, meaning dry, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haploxerults (*Haplo*, meaning minimal horizonation, plus *xerult*, the suborder of the Ultisols that has a xeric moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haploxerults.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle size, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Ultic Haploxerults.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” (Soil Survey Division Staff, 1993). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (USDA, 1975) and in “Keys to Soil Taxonomy” (USDA, 1992). Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section “Detailed Soil Map Units.”

Abegg Series

The Abegg series consists of very deep, well drained soils on terraces and alluvial fans. These soils formed in mixed alluvium. Slopes are 2 to 30 percent. The mean annual precipitation is about

45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Abegg very gravelly sandy loam, 2 to 12 percent slopes; 2,400 feet west and 600 feet north of the southeast corner of sec. 17, T. 27 S., R. 7 W.

A1—0 to 4 inches; dark brown (10YR 3/3) very gravelly sandy loam, pale brown (10YR 6/3) dry; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and nonplastic; many very fine and fine roots; many very fine and fine continuous interstitial and tubular pores; 45 percent sandstone gravel; moderately acid; gradual smooth boundary.

A2—4 to 9 inches; dark brown (10YR 4/3) very gravelly loam, very pale brown (10YR 7/3) dry; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine and fine roots; many very fine continuous tubular pores; 45 percent sandstone gravel and 10 percent cobbles; moderately acid; clear smooth boundary.

BA—9 to 21 inches; dark yellowish brown (10YR 4/4) extremely gravelly loam, very pale brown (10YR 7/4) dry; weak medium and coarse subangular blocky structure; hard, firm, sticky and slightly plastic; common fine and medium roots; many very fine and fine continuous tubular pores; common faint very fine coatings of sand on faces of peds and rock fragments and in pores; 50 percent sandstone gravel and 20 percent cobbles; strongly acid; clear smooth boundary.

Bt—21 to 35 inches; yellowish brown (10YR 5/4) extremely cobbly clay loam, very pale brown (10YR 7/4) dry; moderate medium and coarse subangular blocky structure; very hard, firm, sticky and slightly plastic; few fine and medium roots; many fine and medium continuous tubular pores; common faint very fine coatings of sand on faces of peds and in pores; common distinct dark brown (7.5YR 4/4) clay films on faces of peds and rock fragments and in pores; 40 percent sandstone gravel and 30 percent cobbles; strongly acid; clear smooth boundary.

BCt—35 to 63 inches; yellowish brown (10YR 5/6) extremely cobbly sandy loam, light yellowish brown (10YR 6/4) dry; weak medium and coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine roots; common fine and medium continuous tubular pores; common distinct dark brown (7.5YR 4/4) clay films on faces of peds and in pores; 35 percent gravel and 40 percent cobbles; strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 3 or 4 moist and 3 to 7 dry, and it has chroma of 2 to 4 moist or dry. The lower part of the horizon is very gravelly loam or very gravelly clay loam. The horizon is 35 to 60 percent rock fragments.

The Bt horizon has value of 3 to 5 moist and 4 to 7 dry, and it has chroma of 4 to 6 moist or dry. It is very gravelly loam, extremely gravelly clay loam, or extremely cobbly clay loam and is 45 to 80 percent rock fragments.

The BCt and C horizons have value of 3 to 5 moist and 4 to 7 dry, and they have chroma of 4 to 6 moist or dry. They are extremely cobbly sandy loam, extremely gravelly loamy sand, or very gravelly sandy loam and are 40 to 85 percent rock fragments.

Absaquil Series

The Absaquil series consists of deep, well drained soils on broad ridges and side slopes. These soils formed in residuum and colluvium derived from sandstone and siltstone. Slopes are 3 to 60 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of an Absaquil silt loam in an area of McDuff-Absaquil-Blachly complex, 30 to 60 percent slopes; 2,060 feet north and 850 feet east of the southwest corner of sec. 18, T. 24 S., R. 9 W.

Oi—1.5 inches to 0; slightly decomposed leaves, twigs, and needles.

A1—0 to 4 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/4) dry; strong very fine and fine granular structure; very soft, very friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots and common coarse roots; many very fine and fine irregular pores; 10 percent hard gravel and 10 percent soft siltstone gravel; strongly acid; clear smooth boundary.

A2—4 to 10 inches; dark yellowish brown (10YR 3/4) silt loam, yellowish brown (10YR 5/4) dry; moderate fine and medium subangular blocky structure; very soft, friable, sticky and slightly plastic; many very fine and fine roots and common medium and coarse roots; many very fine and fine irregular pores; 5 percent hard gravel and 5 percent soft siltstone gravel; strongly acid; clear smooth boundary.

Bt1—10 to 16 inches; brown (7.5YR 4/4) silty clay loam, strong brown (7.5YR 5/6) dry; moderate medium and coarse subangular blocky structure; slightly hard, firm, sticky and plastic; common fine and medium roots; common very fine, fine, and medium irregular and tubular pores; common prominent yellowish red (5YR 4/6) clay films in pores; 5 percent hard siltstone gravel and 5 percent soft siltstone gravel; strongly acid; clear smooth boundary.

Bt2—16 to 26 inches; strong brown (7.5YR 4/6) silty clay loam, strong brown (7.5YR 5/6) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; common fine and medium roots; common very fine and fine tubular pores; many prominent yellowish red (5YR 4/6) clay films on faces of peds and in pores; 5 percent hard gravel and 10 percent soft siltstone gravel; very strongly acid; clear smooth boundary.

Bt3—26 to 32 inches; strong brown (7.5YR 4/6) silty clay, reddish yellow (7.5YR 6/6) dry; moderate medium and coarse subangular blocky structure; hard, firm, very sticky and very plastic; common fine and medium roots; common very fine and fine tubular pores; many prominent yellowish red (5YR 4/6) clay films on faces of peds, in pores, and coating rock fragments; 10 percent hard gravel and 10 percent soft siltstone gravel; extremely acid; clear smooth boundary.

BCt—32 to 45 inches; strong brown (7.5YR 4/6) gravelly silty clay, reddish yellow (7.5YR 6/6) dry; weak medium and coarse subangular blocky structure; hard, firm, very sticky and plastic; few very fine and fine roots; few fine tubular pores; many prominent yellowish red (5YR 4/6) clay films on faces of peds, in pores, and coating rock fragments; 20 percent hard gravel and 40 percent soft siltstone gravel; extremely acid; abrupt smooth boundary.

Crt—45 inches; highly weathered and fractured siltstone; many distinct yellowish red (5YR 4/6) clay films along rock fractures.

Depth to bedrock is 40 to 60 inches.

The A horizon has value of 2 to 4 moist and 3 to 6 dry, and it has chroma of 2 to 4 moist or dry.

The Bt horizon has value of 3 to 5 moist and 5 to 7 dry, and it has chroma of 4 to 6 moist or dry. It is clay, silty clay, or silty clay loam.

The BCt horizon, where present, has value of 4 to 6 moist and 5 to 7 dry, and it has chroma of 4 to 8 moist or dry. It is clay or gravelly silty clay.

Acker Series

The Acker series consists of very deep, well drained soils on footslopes and side slopes. These soils formed in colluvium and residuum derived from metamorphic rock. Slopes are 12 to 60 percent. The mean annual precipitation is about 50 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Acker gravelly loam, 12 to 30 percent slopes, 800 feet south and 300 feet west of the northeast corner of sec. 9, T. 32 S., R. 4 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 5 inches; dark brown (7.5YR 3/2) gravelly loam, brown (10YR 5/3) dry; strong fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine, fine, medium, and coarse roots; many very fine irregular pores; 15 percent gravel; strongly acid; abrupt smooth boundary.

AB—5 to 10 inches; dark brown (7.5YR 4/4) clay loam, light brown (7.5YR 6/4) dry; moderate very fine and fine subangular blocky structure; hard, friable, sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine tubular pores; 5 percent gravel; strongly acid; clear smooth boundary.

BA—10 to 19 inches; strong brown (7.5YR 4/6) clay loam, reddish yellow (7.5YR 6/6) dry; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine tubular pores; 5 percent gravel; moderately acid; clear smooth boundary.

Bt1—19 to 32 inches; strong brown (7.5YR 5/6) clay loam, reddish yellow (7.5YR 6/6) dry; moderate medium and coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine tubular pores; 5 percent gravel; common prominent clay films on faces of peds and in pores; strongly acid; clear smooth boundary.

Bt2—32 to 60 inches; strong brown (7.5YR 4/6) clay loam, reddish yellow (7.5YR 6/6) dry; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; few very fine, fine, medium, and coarse roots; few very fine tubular pores; 5 percent gravel; common prominent clay films on faces of peds and in pores; strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist and 4 to 7 dry, and chroma of 2 to 4 moist or dry.

The BA horizon has hue of 10YR or 7.5YR, value of 4 or 5 moist and 6 or 7 dry, and chroma of 3 to 6 moist or dry. The horizon is loam, clay loam, gravelly clay loam, or gravelly loam.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5 moist and 5 to 7 dry, and chroma of 3 to 8 moist or dry. The horizon is gravelly clay loam or clay loam.

The BCt horizon, where present, has hue of 10YR, 7.5YR, or 5YR, value of 4 to 7 moist and 5 to 8 dry, and chroma of 4 to 8 moist. The horizon is very gravelly clay loam, gravelly loam, or gravelly clay loam.

Atring Series

The Atring series consists of moderately deep, well drained soils on side slopes and ridges. These soils formed in colluvium derived from sandstone and metamorphic rock. Slopes are 12 to 90 percent. The mean annual precipitation is about 50 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Atring gravelly loam in an area of Atring-Larmine complex, 60 to 90 percent slopes; 2,000 feet east and 1,800 feet north of the southwest corner of sec. 1, T. 25 S., R. 7 W.

Oi—2 inches to 0; slightly decomposed needles, cones, bark, and lichens.

A—0 to 9 inches; dark grayish brown (10YR 4/2) gravelly loam, light gray (10YR 7/2) dry; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine irregular pores; 20 percent gravel; slightly acid; clear wavy boundary.

Bw1—9 to 20 inches; brown (10YR 4/3) very gravelly loam, very pale brown (10YR 7/3) dry; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common very fine, fine, and medium tubular pores; 50 percent gravel; slightly acid; gradual wavy boundary.

Bw2—20 to 35 inches; yellowish brown (10YR 5/6) very gravelly loam, very pale brown (10YR 7/4) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common very fine, fine, and medium tubular pores; 50 percent coarse gravel and cobbles; moderately acid; clear wavy boundary.

Cr—35 inches; weathered sandstone.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 3 to 5 moist and 5 to 7 dry, and it has chroma of 2 to 4 moist or dry. It is gravelly loam or very gravelly loam and is 15 to 55 percent rock fragments.

The Bw horizon has value of 3 to 5 moist and 5 to 7 dry, and it has chroma of 3 to 6 moist or dry. It is very gravelly loam, very gravelly clay loam, or very gravelly silt loam and is 35 to 60 percent rock fragments.

Banning Series

The Banning series consists of very deep, somewhat poorly drained soils on alluvial fans and terraces. These soils formed in mixed alluvium. Slopes are 0 to 20 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Banning loam, 3 to 12 percent slopes; 3,800 feet north and 1,900 feet west of the southeast corner of sec. 23, T. 30 S., R. 6 W.

A1—0 to 2 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; moderate very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; 14 percent gravel; slightly acid; abrupt smooth boundary.

A2—2 to 15 inches; very dark brown (10YR 2/2) clay loam, dark grayish brown (10YR 4/2) dry; strong very fine and fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 14 percent gravel; slightly acid; clear wavy boundary.

Bt—15 to 35 inches; very dark grayish brown (10YR 3/2) gravelly clay loam, brown (10YR 4/3) dry; many medium distinct dark brown (7.5YR 4/4) mottles; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few faint clay films on faces of peds and in pores; 20 percent gravel; slightly acid; clear wavy boundary.

BC—35 to 60 inches; dark brown (10YR 4/3) clay loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 5 percent gravel; slightly acid.

Depth to bedrock is 60 inches or more.

The A horizon has value of 2 or 3 moist and 3 or 4 dry, and it has chroma of 1 or 2 moist.

The B horizon has hue of 10YR or 7.5YR, value of 2 to 4 moist and 4 or 5 dry, and chroma of 1 to 3 moist or dry. The horizon is clay loam or gravelly clay loam. It is mottled as a result of wetness.

Bashaw Series

The Bashaw series consists of very deep, poorly drained soils on terraces. These soils formed in clayey alluvium. Slopes are 0 to 1 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Bashaw clay, 0 to 1 percent slopes; 1,720 feet south and 200 feet east of the northwest corner of sec. 12, T. 27 S., R. 6 W.

A—0 to 5 inches; black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; strong fine and medium granular structure; hard, very firm, very sticky and very plastic; many very fine, fine, and medium roots; common very fine and fine continuous tubular pores; moderately acid; clear smooth boundary.

AB—5 to 14 inches; black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; massive when wet, weak very coarse prismatic structure parting to medium and coarse subangular blocky when moist or dry; very hard, very firm, very sticky and very plastic; common very fine and fine roots and few medium roots; common very fine discontinuous tubular pores; common pressure faces; moderately acid; clear smooth boundary.

Bss1—14 to 47 inches; very dark gray (2.5Y 3/0) clay, dark gray (2.5Y 4/0) dry; massive when wet, strong very coarse prismatic structure and very coarse angular blocky when moist or dry; extremely hard, extremely firm, very sticky and very plastic; common very fine and fine roots concentrated along faces of peds; few fine discontinuous tubular pores; many intersecting slickensides; many pressure faces; few basalt fragments 1 to 3 centimeters in diameter; moderately acid; gradual smooth boundary.

Bss2—47 to 63 inches; very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; massive; extremely hard, extremely firm, very sticky and very plastic; few very fine roots concentrated along faces of peds; few very fine discontinuous tubular pores; common intersecting slickensides; many pressure faces; few basalt fragments 1 to 3 centimeters in diameter; moderately acid.

Depth to bedrock is 60 inches or more. The soil has cracks that are open for 60 consecutive days or more in summer and closed for 60 consecutive days or more in winter. The profile has hue of 2.5Y or 10YR, value of 2 or 3 moist and 3 or 4 dry, and chroma of 0 to 2 moist or dry.

Bateman Series

The Bateman series consists of very deep, well drained soils on toeslopes, footslopes, side slopes, and ridges. These soils formed in residuum and colluvium derived from sandstone and siltstone. Slopes are 3 to 60 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Bateman silt loam, 12 to 30 percent slopes; 2,190 feet west and 2,190 feet south of the northeast corner of sec. 36, T. 24 S., R. 7 W.

Oi—1 inch to 0; slightly decomposed needles, twigs, leaves, and mosses.

A—0 to 7 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine, fine, and medium irregular pores; 5 percent gravel; moderately acid; clear wavy boundary.

BA—7 to 15 inches; dark brown (7.5YR 4/4) silty clay loam, light brown (7.5YR 6/4) dry; weak fine subangular blocky structure; very hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots and few coarse roots; common very fine, fine, and medium tubular pores; very few faint clay films on faces of peds and in pores; 5 percent gravel; strongly acid; clear wavy boundary.

Bt1—15 to 32 inches; dark brown (7.5YR 4/4) silty clay loam, reddish yellow (7.5YR 6/6) dry; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; common very fine to coarse roots; few very fine tubular pores; common distinct clay films on faces of peds and in pores; 5 percent gravel; strongly acid; gradual wavy boundary.

Bt2—32 to 50 inches; reddish brown (5YR 4/4) silty clay loam, reddish yellow (7.5YR 6/6) dry; moderate medium subangular blocky structure; extremely hard, friable, sticky and plastic; common fine and few coarse roots; few very fine tubular pores; many distinct clay films on faces of peds and in pores; 10 percent gravel; strongly acid; gradual wavy boundary.

BCt—50 to 63 inches; dark brown (7.5YR 4/4) gravelly silty clay loam, reddish yellow (7.5YR 6/6) dry; moderate coarse subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common fine and few coarse roots; few very fine tubular pores; many distinct clay films on faces of peds and in pores; 20 percent gravel; strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5 moist and 6 or 7 dry, and chroma of 3 or 4 moist and 3 to 6 dry.

The Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5 moist and 5 to 7 dry, and chroma of 4 to 6 moist and 5 to 8 dry. The horizon is silty clay loam or silty clay.

The BC horizon, where present, is gravelly silty clay loam or gravelly clay loam.

Beal Series

The Beal series consists of very deep, moderately well drained soils on footslopes and side slopes. These soils formed in residuum and colluvium derived from granodiorite and mica schist. Slopes are 3 to 60 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Beal loam in an area of Lettia-Beal-Zing complex, 30 to 60 percent south slopes; 475 feet east and 160 feet north of the southwest corner of sec. 21, T. 30 S., R. 2 W.

Oi—0.5 inch to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; weak fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and common fine, medium, and coarse roots; common very fine and fine tubular pores; 10 percent gravel; strongly acid; clear smooth boundary.

BA—4 to 10 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; hard, firm, sticky and slightly plastic; common very fine, fine, medium, and coarse roots; common very fine and fine tubular pores; 10 percent gravel; strongly acid; clear wavy boundary.

Bw—10 to 18 inches; dark yellowish brown (10YR 4/4) loam, light yellowish brown (10YR 6/4) dry; weak fine, medium, and coarse subangular blocky structure; very hard, very firm, sticky and slightly plastic; common very fine and fine roots and few medium and coarse roots; common very fine, fine, and medium tubular pores; 5 percent gravel; strongly acid; clear wavy boundary.

Bt—18 to 39 inches; dark yellowish brown (10YR 3/6) clay loam, light yellowish brown (10YR 6/4) dry; 25 percent light olive brown (2.5Y 5/4) mottles, light gray (2.5Y 7/2) dry, and 10 percent dark yellowish brown (10YR 4/6) mottles, yellowish brown (10YR 5/6) dry; moderate medium and coarse subangular blocky structure; very hard, very firm, sticky and plastic; common very fine and fine roots and few medium roots; many very fine, fine, and medium tubular pores; common distinct clay films on faces of peds and in pores; 5 percent gravel; strongly acid; clear wavy boundary.

Btg1—39 to 49 inches; pale olive (5Y 6/3) clay loam, light gray (5Y 7/2) dry; 25 percent strong brown (7.5YR 5/6) and (7.5YR 5/8) mottles; moderate medium and coarse subangular blocky structure; very hard, very firm, sticky and plastic; few very fine roots in peds and few fine and medium roots on faces of peds; many very fine and fine tubular pores; common distinct clay films on faces of peds and in pores; 5 percent gravel; moderately acid; clear wavy boundary.

Btg2—49 to 56 inches; light olive brown (2.5Y 5/4) clay, light gray (2.5Y 7/2) dry; 20 percent olive (5Y 5/3) mottles, light gray (5Y 7/1) dry, and 15 percent dark yellowish brown (10YR 4/6) mottles, yellowish brown (10YR 5/6) dry; moderate coarse subangular blocky structure; very hard, very firm, sticky and plastic; few very fine roots; common very fine and fine tubular pores; many distinct clay films on faces of peds and in pores; 10 percent gravel; neutral; clear wavy boundary.

Btg3—56 to 60 inches; olive (5Y 5/3) clay, light gray (5Y 7/2) dry; moderate coarse subangular blocky structure; very hard, very firm, very sticky and plastic; few very fine roots; common very fine and fine tubular pores; many distinct clay films on faces of peds and in pores; 10 percent gravel; neutral.

Depth to bedrock is 60 inches or more. Depth to mottles, which are a result of wetness, is 15 to 25 inches.

The A horizon has hue of 2.5Y or 10YR, value of 2 to 4 moist and 3 to 6 dry, and chroma of 1 to 4 moist and 2 to 4 dry.

The Bt horizon has hue of 2.5Y or 10YR, value of 3 to 5 moist and 5 or 6 dry, and chroma of 3 to 6 moist or dry. The horizon is loam or clay loam.

The matrix of the Btg horizon has hue of 5Y or 2.5Y, value of 4 to 6 moist and 6 to 8 dry, and chroma of 2 to 4 moist and 1 to 3 dry. The horizon is clay loam or clay.

Beekman Series

The Beekman series consists of moderately deep, well drained soils on side slopes. These soils formed in colluvium derived from sandstone and metamorphic rock. Slopes are 30 to 90 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Beekman gravelly loam in an area of Beekman-Vermisa complex, 60 to 90 percent south slopes; 1,100 feet west and 800 feet south of the northeast corner of sec. 9, T. 32 S., R. 7 W.

A—0 to 5 inches; brown (10YR 4/3) gravelly loam, light yellowish brown (10YR 6/4) dry; moderate very fine, fine, and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; 25 percent gravel; moderately acid; clear smooth boundary.

Bw1—5 to 18 inches; dark yellowish brown (10YR 4/4) very gravelly loam, light yellowish brown (10YR 6/4) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots, common fine and medium roots, and few coarse roots; many very fine and fine and few medium and coarse irregular pores; 35 percent gravel and 10 percent cobbles; moderately acid; gradual irregular boundary.

Bw2—18 to 26 inches; dark yellowish brown (10YR 4/6) very gravelly clay loam, yellow (10YR 7/6) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium and few coarse roots; common very fine and fine and few coarse irregular pores; 35 percent gravel and 10 percent cobbles; moderately acid; abrupt irregular boundary.

R—26 inches; sedimentary rock.

Depth to bedrock is 20 to 40 inches.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist and 4 to 6 dry, and chroma of 2 to 4 moist and 3 or 4 dry. The horizon is 15 to 35 percent rock fragments.

The Bw horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 4 or 5 moist and 5 to 7 dry, and chroma of 3 to 6 moist or dry. The horizon is very gravelly loam, extremely gravelly loam, or very gravelly clay loam and is 35 to 70 percent rock fragments.

Bellpine Series

The Bellpine series consists of moderately deep, well drained soils on toeslopes, footslopes, side slopes, and ridges. These soils formed in colluvium and residuum derived from sandstone and siltstone. Slopes are 3 to 60 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Bellpine silt loam, 3 to 12 percent slopes; 2,385 feet east and 900 feet north of the southwest corner of sec. 12, T. 24 S., R. 6 W.

A1—0 to 6 inches; dark brown (5YR 3/4) silt loam, reddish brown (5YR 5/4) dry; moderate fine and medium and very fine and fine subangular blocky structure; hard, firm, slightly sticky and plastic; many very fine and fine roots; many very fine and fine continuous tubular pores; moderately acid; clear smooth boundary.

A2—6 to 11 inches; dark reddish brown (5YR 3/4) silt loam, reddish brown (5YR 5/4) dry; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots; many very fine and fine continuous tubular pores; common faint clay films on faces of peds and in pores; moderately acid; clear smooth boundary.

Bt1—11 to 24 inches; yellowish red (5YR 4/6) silty clay, yellowish red (5YR 5/6) crushed and dry; moderate medium and coarse subangular blocky structure; very hard, very firm, sticky and very plastic; common fine and medium roots; common very fine and fine continuous tubular pores; many distinct yellowish red (5YR 4/6) clay films on faces of peds and in pores; 5 percent highly weathered siltstone gravel 2 to 5 millimeters in diameter; very strongly acid; clear smooth boundary.

Bt2—24 to 30 inches; yellowish red (5YR 4/6) silty clay, yellowish red (5YR 5/6) crushed and dry; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; few very fine and fine continuous tubular pores; common faint and distinct dark red (2.5YR 3/6) clay films on faces of peds and in pores; 45 percent highly weathered siltstone gravel 2 to 30 millimeters in diameter; very strongly acid.

Crt—30 inches; fractured and highly weathered siltstone; faint and distinct dark red (2.5YR 3/6) clay films in fractures; many fine and medium coatings of manganese.

Depth to bedrock is 20 to 40 inches.

The A horizon has hue of 7.5YR or 5YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 2 to 4 moist and 3 or 4 dry. The horizon is silt loam or clay loam.

The Bt horizon has hue of 5YR or 2.5YR, value of 3 or 4 moist and 4 to 6 dry, and chroma of 4 to 6 moist or dry. The horizon is silty clay or clay. It is 0 to 35 percent soft, weathered rock fragments, the percentage of which increases as depth increases.

Bickford Series

The Bickford series consists of very deep, somewhat poorly drained soils on toeslopes. These soils formed in silty colluvium over older clayey alluvium. Slopes are 3 to 12 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Bickford silt loam, 3 to 12 percent slopes; 1,980 feet west and 1,860 feet north of the southeast corner of sec. 5, T. 24 S., R. 9 W.

A1—0 to 5 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; strong fine and medium granular structure; slightly hard, friable, sticky and slightly plastic; many very fine and fine roots and common medium roots; many fine irregular pores; strongly acid; clear smooth boundary.

A2—5 to 12 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (2.5Y 5/2) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and slightly plastic; many very fine, fine, and medium roots; many fine irregular pores; moderately acid; clear wavy boundary.

Bw—12 to 16 inches; grayish brown (2.5Y 5/2) silt loam, light gray (2.5Y 7/2) dry; few fine distinct yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; hard, firm, sticky and slightly plastic; many very fine, fine, and medium roots; many fine irregular pores; moderately acid; abrupt broken boundary.

2BCg—16 to 42 inches; gray (5Y 5/1) clay, light gray (5Y 6/1) dry; many medium and coarse prominent strong brown (7.5YR 5/8) irregularly shaped mottles; strong very coarse prismatic structure; extremely hard, extremely firm, very sticky and very plastic; few very fine and fine roots; common very fine and fine tubular pores; common prominent stress surfaces on polyhedral faces; very strongly acid; gradual smooth boundary.

2Cg—42 to 60 inches; light olive gray (5Y 6/2) silty clay, light gray (5Y 7/2) dry; many medium and coarse prominent strong brown (7.5YR 5/8) irregularly shaped mottles; massive; very hard, very firm, very sticky and very plastic; very strongly acid.

Depth to bedrock is 60 inches or more. Depth to the 2BCg horizon is 12 to 20 inches.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3 moist and 4 or 5 dry, and chroma of 1 or 2 moist or dry.

The Bw horizon has hue of 10YR or 2.5Y, value of 5 or 6 moist and 7 or 8 dry, and chroma of 2 moist or dry. The horizon has distinct or prominent mottles that have high chroma. It is silt loam or silty clay loam.

The 2BCg and 2Cg horizons have hue of 2.5Y to 5Y, value of 5 or 6 moist and 6 or 7 dry, and chroma of 1 or 2 moist or dry. The horizons are clay or silty clay.

Bigdutch Series

The Bigdutch series consists of moderately deep, well drained soils on ridges and side slopes. These soils formed in residuum and colluvium derived from sandstone. Slopes are 3 to 60 percent. The mean annual precipitation is about 60 inches, and the mean annual air temperature is about 43 degrees

Typical pedon of Bigdutch gravelly loam, 3 to 12 percent slopes; 1,000 feet north and 2,200 feet east of the southwest corner of sec. 8, T. 31 S., R. 8 W., W.M.

Oi—2 inches to 0; slightly decomposed needles and twigs.

A—0 to 4 inches; dark brown (7.5YR 3/3) gravelly loam, dark brown (10YR 4/3) dry; moderate fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and common fine, medium, and coarse roots; many very fine irregular pores; 30 percent gravel and 4 percent cobbles; strongly acid; clear smooth boundary.

Bw1—4 to 17 inches; dark brown (7.5YR 3/4) gravelly loam, brown (7.5YR 5/4) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; common very fine tubular pores; 20 percent gravel and 5 percent cobbles; very strongly acid; abrupt wavy boundary.

Bw2—17 to 21 inches; dark brown (7.5YR 3/4) very cobbly clay loam, strong brown (7.5YR 5/6) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common very fine tubular pores; 30 percent gravel and 25 percent cobbles; very strongly acid; abrupt wavy boundary.

R—21 inches; sandstone.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 3 to 5 dry, and it has chroma of 2 to 4 moist or dry.

The Bw horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 3 to 6 moist or dry. It is very cobbly clay loam, extremely cobbly loam, or extremely cobbly clay loam. In some pedons the upper part of the Bw horizon is gravelly or very gravelly clay loam. The horizon is 35 to 80 percent rock fragments.

Blachly Series

The Blachly series consists of very deep, well drained soils on ridges and side slopes. These soils formed in residuum and colluvium derived from sandstone and siltstone. Slopes are 3 to 70 percent. The mean annual precipitation is about 90 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Blachly silty clay loam, 3 to 30 percent slopes; 660 feet west and 50 feet north of the southeast corner of sec. 26, T. 23 S., R. 10 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, twigs, and mosses.

A1—0 to 3 inches; dark reddish brown (5YR 3/4) silty clay loam, reddish brown (5YR 4/4) dry; moderate very fine and fine granular structure; soft, friable, sticky and plastic; many fine and medium roots and few very fine roots; many very fine and fine and few medium irregular pores; 15 percent weathered siltstone gravel; strongly acid; clear smooth boundary.

A2—3 to 10 inches; dark reddish brown (5YR 3/4) silty clay loam, reddish brown (5YR 4/4) dry; moderate fine and medium granular structure; soft, friable, sticky and plastic; common fine and medium roots and few very fine roots; many very fine and fine irregular pores; 5 percent weathered siltstone gravel; strongly acid; clear smooth boundary.

BA—10 to 21 inches; dark red (2.5YR 3/6) clay, red (2.5YR 4/6) dry; moderate fine and medium subangular blocky structure; slightly hard, firm, sticky and plastic; weak fine and medium roots; many very fine and fine continuous tubular pores; few faint coatings of silt on faces of peds; very strongly acid; clear smooth boundary.

Bw1—21 to 30 inches; red (2.5YR 4/6) clay, red (2.5YR 4/6) dry; weak medium and coarse subangular blocky structure; slightly hard, firm, sticky and plastic; few fine roots; common very fine and fine continuous tubular and irregular pores; few faint coatings of silt on peds; very strongly acid; clear smooth boundary.

Bw2—30 to 44 inches; red (2.5YR 4/6) clay, red (2.5YR 4/8) dry; weak medium and coarse subangular blocky structure; hard, firm, very sticky and very plastic; few fine roots; common very fine and fine and few medium continuous tubular pores; few faint coatings of silt on peds; very strongly acid; clear smooth boundary.

Bw3—44 to 54 inches; red (2.5YR 4/6) clay, red (2.5YR 5/8) dry; weak medium and coarse subangular blocky structure; hard, very firm, very sticky and very plastic; few fine roots; common very fine and fine and few medium continuous tubular pores; few faint coatings of silt on peds; 10 percent weathered siltstone gravel; very strongly acid; clear smooth boundary.

Bw4—54 to 60 inches; red (2.5YR 4/6) clay, red (2.5YR 5/8) dry; weak medium and coarse subangular blocky structure; hard, very firm, very sticky and very plastic; 20 percent weathered siltstone gravel; very strongly acid.

Depth to bedrock is 60 inches or more. The content of weathered rock fragments ranges from 0 to 20 percent in the upper part, and it can be as much as 20 to 50 percent below a depth of 60 inches.

The A horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 2 or 3 moist and 3 or 4 dry, and chroma of 2 to 4 moist or dry.

The Bw horizon has hue of 5YR or 2.5YR, value of 3 or 4 moist and 4 to 6 dry, and chroma of 2 to 6 moist and 4 to 8 dry. The horizon is silty clay or clay.

Bohannon Series

The Bohannon series consists of moderately deep, well drained soils on ridges and side slopes. These soils formed in colluvium and residuum derived from sandstone and siltstone. Slopes are 3 to 90 percent. The mean annual precipitation is about 85 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Bohannon gravelly loam in an area of Bohannon-Preacher-Damewood complex, 60 to 90 percent slopes; 2,050 feet east and 1,600 feet north of the southwest corner of sec. 15, T. 20 S., R. 9 W.

Oi—2 inches to 0; slightly decomposed needles, leaves, twigs, and mosses.

A1—0 to 4 inches; very dark brown (10YR 2/2) gravelly loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine irregular pores; 25 percent gravel and 5 percent cobbles; moderately acid; clear smooth boundary.

A2—4 to 12 inches; very dark grayish brown (10YR 3/2) gravelly loam, brown (10YR 5/3) dry; moderate very fine and fine subangular blocky structure parting to fine and medium granular;

soft, friable, slightly sticky and slightly plastic; common fine and medium roots and few coarse roots; many very fine and fine continuous tubular and irregular pores; 15 percent gravel; strongly acid; clear smooth boundary.

Bw1—12 to 26 inches; dark brown (10YR 4/3) gravelly loam, light yellowish brown (10YR 6/4) dry; weak fine and medium subangular blocky structure; soft, friable, sticky and plastic; few fine and medium roots; many very fine and fine continuous tubular pores; few faint coatings of very fine sand and silt on faces of peds; 15 percent gravel; very strongly acid; clear smooth boundary.

Bw2—26 to 32 inches; dark yellowish brown (10YR 4/4) gravelly loam, light yellowish brown (10YR 6/4) dry; weak fine and medium subangular blocky structure; soft, friable, sticky and plastic; few fine roots; common very fine and fine continuous tubular pores; few faint coatings of very fine sand and silt in pores; 25 percent gravel; very strongly acid; clear smooth boundary.

Cr—32 inches; weathered sandstone.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bw horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 3 or 4 moist or dry. It is gravelly loam, cobbly loam, or cobbly clay loam.

Brader Series

The Brader series consists of shallow, well drained soils on toeslopes, footslopes, side slopes, and ridges. These soils formed in colluvium and residuum derived from sandstone and siltstone. Slopes are 2 to 60 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Brader loam in an area of Debenger-Brader complex, 30 to 60 percent slopes; 1,800 feet north and 1,800 feet east of the southwest corner of sec. 33, T. 30 S., R. 6 W.

A—0 to 2 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; moderate very fine and fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; 1 percent gravel; slightly acid; abrupt smooth boundary.

Bw—2 to 12 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine roots; many very fine tubular pores; 1 percent gravel; moderately acid; abrupt wavy boundary.

Cr—12 inches; weathered sandstone.

Depth to bedrock is 12 to 20 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 2 to 4 moist or dry.

The Bw horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 3 or 4 moist or dry. It is loam, clay loam, or gravelly loam.

Bragton Series

The Bragton series consists of very deep, very poorly drained, organic soils in low tidal basins and on flood plains. These soils formed in decomposed, fibrous organic material over sandy or silty alluvium. Slopes are 0 to 1 percent. The mean annual precipitation is about 70 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Bragton muck, 0 to 1 percent slopes, in the NW1/4NE1/4 of sec. 31, T. 18 S., R. 11 W.

Oe1—0 to 13 inches; dark brown (7.5YR 3/2) muck, grayish brown (10YR 5/2) dry; prominent reddish brown (5YR 4/4) and yellowish red (5YR 5/6) stains along root channels; about 60 percent identifiable plant parts or fibers, 20 percent rubbed; nonsticky and nonplastic; many fine and common very fine roots; spongy and porous; moderately acid; strong odor of sulfur dioxide; gradual wavy boundary.

Oe2—13 to 25 inches; very dark brown (10YR 2/2) muck, gray (10YR 5/2) dry; about 50 percent identifiable plant parts or fibers, 15 percent rubbed; visible flecks of mica; nonsticky and nonplastic; common fine and medium roots; spongy and porous; neutral; odor of sulfur dioxide; abrupt wavy boundary.

Oe3—25 to 38 inches; dark brown (7.5YR 3/2) and very dark grayish brown (10YR 3/2) muck, gray (10YR 5/1) dry; visible flecks of mica; nonsticky and nonplastic; common fine and few medium roots; neutral; odor of sulfur dioxide; abrupt wavy boundary.

2C—38 to 60 inches; very dark gray (5Y 3/1) silt loam; highly micaceous; massive; very hard, friable, nonsticky and nonplastic; neutral.

Depth to bedrock is 60 inches or more. Thickness of the organic material is 16 to 50 inches. These soils are saturated with water throughout the year, and they are inundated daily by brackish tidewater.

The surface tier has chroma of 1 to 3.

The 2C horizon is stratified silt loam or fine sandy loam.

Brand Series

The Brand series consists of very deep, poorly drained soils on terraces. These soils formed in clayey alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Brand silty clay loam, 0 to 3 percent slopes; 1,350 feet north and 1,475 feet west of the southeast corner of sec. 36, T. 25 S., R. 7 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; few fine distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; many very fine roots; many very fine and fine tubular pores; strongly acid; clear smooth boundary.

A—8 to 15 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; common fine distinct strong brown (7.5YR 5/6) mottles; weak medium and fine subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; many very fine and fine tubular pores; strongly acid; clear smooth boundary.

Bw—15 to 26 inches; grayish brown (2.5Y 5/2) silty clay, light brownish gray (10YR 6/2) dry; many fine distinct strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to weak fine subangular blocky; very hard, firm, very sticky and very plastic; few very fine roots; many very fine tubular pores; many large black stains on faces of peds; strongly acid; clear wavy boundary.

BCt—26 to 50 inches; grayish brown (10YR 5/2) clay, light brownish gray (10YR 6/2) dry; many fine prominent strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure and weak very coarse subangular blocky; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; common faint clay films in pores; many large black stains on faces of peds; strongly acid; clear wavy boundary.

C—50 to 60 inches; grayish brown (10YR 5/2) clay, light brownish gray (10YR 6/2) dry; many medium prominent strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2) mottles; massive; very hard, very firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; slightly acid.

Depth to bedrock is 60 inches or more. Mottles that are a result of wetness are throughout the profile.

The A horizon has value of 3 or 4 moist and 6 or 7 dry, and it has chroma of 1 or 2 moist or dry.

The Bw horizon has hue of 2.5Y or 10YR, value of 4 or 5 moist and 5 or 6 dry, and chroma of 2 or 3 moist or dry. It is silty clay or clay.

The BC and C horizons have colors similar to those of the Bw horizon. These horizons are stratified with coarser material in some pedons.

Buckeye Series

The Buckeye series consists of moderately deep, well drained soils on footslopes, side slopes, and ridges. These soils formed in colluvium and residuum derived from metamorphic rock. Slopes are 2 to 60 percent. The mean annual precipitation is about 40 inches, and the mean annual air temperature is about 53 degrees F.

Typical pedon of Buckeye loam, 20 to 30 percent slopes; 2,000 feet south and 2,000 feet west of the northeast corner of sec. 2, T. 28 S., R. 5 W.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine continuous irregular and tubular pores; moderately acid; clear smooth boundary.

A2—2 to 6 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate very fine, fine, and medium subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine continuous irregular and tubular pores; moderately acid; clear smooth boundary.

AB—6 to 13 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak medium and coarse subangular blocky structure; very hard, very firm, sticky and plastic; common very fine and fine roots; many very fine and fine continuous tubular pores; many very fine coatings of sand and silt on faces of peds; 10 percent greenstone gravel; strongly acid; clear smooth boundary.

BA—13 to 25 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate fine, medium, and coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots; few very fine and fine continuous tubular pores; 10 percent greenstone gravel; strongly acid; gradual smooth boundary.

Bt—25 to 35 inches; dark brown (10YR 3/3) gravelly clay loam, brown (10YR 5/3) dry; common fine distinct strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; common very fine and fine continuous tubular pores; common faint very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; 25 percent greenstone gravel; strongly acid; abrupt smooth boundary.

R—35 inches; greenstone; few prominent clay films in fractures.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bt horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 to 4 moist or dry. It is loam, clay loam, or gravelly clay loam.

Buckshot Series

The Buckshot series consists of very deep, well drained soils on ridges and side slopes. These soils formed in colluvium and residuum derived from granodiorite. Slopes are 3 to 90 percent. The mean annual precipitation is about 55 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Buckshot sandy loam in an area of Buckshot-Stinger complex, 60 to 90 percent north slopes; 1,600 feet west and 300 feet south of the northeast corner of sec. 29, T. 27 S., R. 3 W.

Oi—0.5 inch to 0; slightly decomposed needles and twigs.

A—0 to 4 inches; dark brown (7.5YR 3/2) sandy loam, dark grayish brown (10YR 4/2) dry; moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots and common fine, medium, and coarse roots; many very fine irregular pores; 14 percent gravel; neutral; abrupt smooth boundary.

Bw1—4 to 11 inches; brown (7.5YR 4/4) loam, light yellowish brown (10YR 6/4) dry; moderate very fine and fine granular structure; slightly hard, very friable, nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; many very fine irregular pores; 10 percent gravel; moderately acid; clear wavy boundary.

Bw2—11 to 30 inches; dark yellowish brown (10YR 4/4) loam, light yellowish brown (10YR 6/4) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and few fine, medium, and coarse roots; many very fine tubular pores; 10 percent gravel; moderately acid; clear wavy boundary.

Bt—30 to 60 inches; yellowish brown (10YR 5/6) clay loam, very pale brown (10YR 7/3) dry; moderate medium and coarse angular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common very fine tubular pores; many distinct clay films on faces of peds and in pores; 1 percent gravel; very strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 2 to 4 moist or dry.

The Bw horizon has value of 4 or 5 moist and 6 or 7 dry, and it has chroma of 4 to 6 moist or dry. It is loam or sandy loam.

The Bt horizon has value of 4 or 5 moist and 6 or 7 dry, and it has chroma of 3 to 6 moist or dry. It is clay loam, sandy clay loam, or loam.

Camas Series

The Camas series consists of very deep, excessively drained soils on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Camas very gravelly sandy loam in an area of Camas-Newberg complex, 0 to 3 percent slopes; 125 feet north and 1,750 feet west of the southeast corner of sec. 18, T. 30 S., R. 5 W.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) very gravelly sandy loam, brown (10YR 5/3) dry; weak very fine and fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots and common fine and medium roots; many fine irregular pores; 35 percent gravel; moderately acid; abrupt smooth boundary.

A2—2 to 12 inches; dark brown (10YR 3/3) very gravelly sandy loam, brown (10YR 5/3) dry; massive; slightly hard, friable, nonsticky and nonplastic; many very fine and common fine, medium, and coarse roots; many fine irregular pores; 50 percent gravel; moderately acid; clear wavy boundary.

AC—12 to 17 inches; dark yellowish brown (10YR 3/4) very gravelly sandy loam, yellowish brown (10YR 5/4) dry; massive; slightly hard, friable, nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; many fine irregular pores; 45 percent gravel; moderately acid; clear wavy boundary.

C—17 to 60 inches; dark yellowish brown (10YR 3/4) very gravelly loamy sand, yellowish brown (10YR 5/4) dry; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; many very fine irregular pores; 45 percent gravel and 10 percent cobbles; moderately acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The C horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 2 to 4 moist or dry. It is very gravelly loamy sand, very gravelly sand, or extremely gravelly coarse sand and is 45 to 85 percent rock fragments.

Cedargrove Series

The Cedargrove series consists of very deep, well drained soils on footslopes, side slopes, and ridges. These soils formed in residuum and colluvium derived from granodiorite. Slopes are 3 to 60 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of Cedargrove silt loam in an area of Greengulch-Cedargrove complex, 30 to 60 percent north slopes; 2,100 feet south and 650 feet west of the northeast corner of sec. 29, T. 29 S., R. 4 W.

Oi—1 inch to 0; slightly decomposed grasses, twigs, bark, and leaves.

A1—0 to 7 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/4) dry; moderate very fine subangular blocky structure parting to moderate very fine and fine granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; many fine and common medium pores; strongly acid; clear smooth boundary.

A2—7 to 14 inches; dark brown (7.5YR 3/4) silt loam, light brown (7.5YR 6/4) dry; moderate very fine and fine subangular blocky structure parting to moderate very fine and fine granular; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots, common fine and medium roots, and few coarse roots; many very fine, fine, and medium irregular pores; moderately acid; clear smooth boundary.

Bt1—14 to 18 inches; dark brown (7.5YR 3/4) silty clay loam, yellowish brown (10YR 5/4) dry; moderate fine and medium subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; few very fine roots, common fine and medium roots, and few coarse roots; many very fine and fine, common medium, and few coarse irregular pores; very few faint clay films on faces of peds and in pores; moderately acid; clear smooth boundary.

Bt2—18 to 30 inches; dark brown (7.5YR 3/4) silty clay loam, yellowish brown (10YR 5/4) dry; few medium faint strong brown (7.5YR 4/6) variegations; strong medium and coarse subangular blocky structure; extremely hard, firm, sticky and plastic; few fine roots; common very fine and fine irregular pores; common prominent clay films on faces of peds and in pores; moderately acid; gradual smooth boundary.

Bt3—30 to 46 inches; dark brown (10YR 4/3) clay, light olive brown (2.5Y 5/4) dry; few medium faint strong brown (7.5YR 4/6) variegations; strong medium and coarse subangular blocky structure; extremely hard, firm, sticky and plastic; few fine and medium roots; common very fine irregular pores; common prominent clay films on faces of peds and in pores; moderately acid; gradual smooth boundary.

Bt4—46 to 60 inches; dark brown (10YR 4/3) clay, light olive brown (2.5Y 5/4) dry; few medium faint strong brown (7.5YR 5/4) variegations; moderate fine, medium, and coarse subangular blocky structure; extremely hard, firm, sticky and plastic; few fine roots; common very fine irregular pores; few faint clay films on faces of peds and in pores; slightly acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist and 5 to 7 dry, and chroma of 2 to 4 moist and 3 or 4 dry.

The Bt horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 3 to 5 moist and 5 to 7 dry, and chroma of 3 to 6 moist or dry. It is silty clay loam, silty clay, or clay.

Central Point Series

The Central Point series consists of very deep, well drained soils on terraces. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 40 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Central Point loam, 0 to 3 percent slopes; 3,000 feet south and 1,000 feet east of the northwest corner of sec. 4, T. 32 S., R. 4 W.

A1—0 to 10 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, common fine, and few medium roots; many very fine irregular pores; 1 percent gravel; slightly acid; clear smooth boundary.

A2—10 to 20 inches; very dark grayish brown (10YR 3/2) loam, dark brown (10YR 4/3) dry; moderate fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and few fine roots; many very fine tubular pores; 1 percent gravel; slightly acid; clear wavy boundary.

Bw—20 to 35 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine and fine roots; common very fine tubular pores; 5 percent gravel; neutral; gradual wavy boundary.

C—35 to 60 inches; dark brown (10YR 3/3) gravelly sandy loam, brown (10YR 5/3) dry; massive; slightly hard, friable, nonsticky and nonplastic; few very fine roots; common very fine tubular pores; 20 percent gravel; neutral.

Depth to bedrock is 60 inches or more.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 1 to 3 moist or dry.

The Bw horizon has value of 4 or 5 dry and chroma of 2 or 3 moist or dry.

The C horizon has value of 4 or 5 dry and chroma of 2 or 3 moist or dry. It is gravelly sandy loam or gravelly loamy sand.

Chamate Series

The Chamate series consists of very deep, well drained soils on footslopes and side slopes. These soils formed in colluvium derived from welded tuff. Slopes are 3 to 60 percent. The mean annual precipitation is about 55 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Chamate extremely gravelly loam, 30 to 60 percent slopes (fig. 17, p. 554); 1,600 feet west and 500 feet south of the northeast corner of sec. 13, T. 27 S., R. 3 W.

Oi—0.5 inch to 0; slightly decomposed needles, cones, mosses, and lichens.

A—0 to 7 inches; dark grayish brown (10YR 4/2) extremely gravelly loam, light brownish gray (10YR 6/2) dry; single grain; loose, nonsticky and nonplastic; many very fine and fine roots and few medium roots; 80 percent gravel; slightly acid; abrupt smooth boundary.

AB—7 to 15 inches; dark brown (10YR 4/3) very gravelly loam, light gray (10YR 7/2) dry; moderate medium granular structure; soft, friable, nonsticky and nonplastic; many very fine and fine roots; common very fine tubular pores; 45 percent gravel; neutral; clear smooth boundary.

Bw1—15 to 33 inches; brown (10YR 4/3) very gravelly loam, light gray (10YR 7/2) dry; weak medium subangular blocky structure parting to weak medium granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine and medium roots; many very fine, fine, and medium tubular pores; 45 percent gravel; neutral; gradual wavy boundary.

Bw2—33 to 56 inches; brown (10YR 5/3) very gravelly loam, very pale brown (10YR 7/3) dry; weak medium and coarse subangular blocky structure; slight hard, friable, slightly sticky and slightly plastic; few fine roots; many very fine and fine tubular pores; 55 percent gravel; neutral; clear wavy boundary.

C—56 to 65 inches; brown (10YR 5/3) extremely gravelly loam, very pale brown (10YR 7/3) dry; massive; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots; many very fine and fine tubular pores; 65 percent gravel and 10 percent cobbles; neutral.

Depth to bedrock is 60 inches or more.

The A horizon has value of 3 to 5 moist and 5 to 7 dry, and it has chroma of 2 to 4 moist and 2 or 3 dry. It is 60 to 80 percent gravel and 0 to 20 percent cobbles.

The Bw and C horizons have hue of 10YR or 7.5YR, value of 4 or 5 moist and 6 to 8 dry, and chroma or 3 or 4 moist and 2 or 3 dry. The horizons are very gravelly loam, very gravelly sandy loam, extremely gravelly loam, or extremely gravelly sandy loam. They are 40 to 65 percent gravel and 0 to 20 percent cobbles.

Chapman Series

The Chapman series consists of very deep, well drained soils on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Chapman loam in an area of Chapman-Chehalis complex, 0 to 3 percent slopes; 500 feet west and 330 feet north of the southeast corner of sec. 20, T. 28 S., R. 6 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure and very fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and few medium roots; many very fine irregular pores; moderately acid; clear smooth boundary.

A1—8 to 16 inches; very dark grayish brown (10YR 3/2) loam, brown (10YR 5/3) dry; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine continuous tubular pores; common faint very dark brown (10YR 2/2) organic coatings on faces of peds and in pores; moderately acid; clear smooth boundary.

A2—16 to 25 inches; very dark grayish brown (10YR 3/2) loam, brown (10YR 5/3) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine and fine and common medium continuous tubular pores; many faint very dark brown (10YR 2/2) organic coatings on faces of peds and in pores; moderately acid; clear smooth boundary.

Bw1—25 to 40 inches; dark brown (10YR 3/3) loam, yellowish brown (10YR 5/4) dry; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine and few medium continuous tubular pores; common faint very dark brown (10YR 2/2) organic coatings on faces of peds and in pores; moderately acid; clear smooth boundary.

Bw2—40 to 60 inches; very dark grayish brown (10YR 3/2) loam, brown (10YR 5/3) dry; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine and fine continuous tubular pores; few faint very dark brown (10YR 2/2) organic coatings on faces of peds and in pores; slightly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR. Layers of gravelly or very gravelly sandy loam are below a depth of 40 inches in some areas.

The A horizon has value of 3 to 5 dry and chroma of 2 or 3 moist or dry.

The Bw horizon has value of 3 or 4 moist and 5 or 6 dry, and it has chroma of 2 to 4 moist or dry. It is loam or clay loam.

Chehalis Series

The Chehalis series consists of very deep, well drained soils on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Chehalis silt loam in an area of Chapman-Chehalis complex, 0 to 3 percent slopes; 2,475 feet east and 330 feet south of the northwest corner of sec. 28, T. 28 S., R. 6 W.

A1—0 to 8 inches; dark brown (10YR 3/3) silt loam, dark brown (10YR 4/3) dry; moderate fine and medium granular structure and very fine and fine subangular blocky; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many very fine and fine and few medium irregular pores; moderately acid; gradual smooth boundary.

A2—8 to 16 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate fine and medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine continuous tubular and irregular pores; common faint very fine coatings of sand and silt on faces of peds; moderately acid; gradual smooth boundary.

Bw1—16 to 26 inches; very dark grayish brown (10YR 3/2) silty clay loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure; soft, friable, sticky and plastic; many very fine and fine roots; many very fine and fine continuous tubular pores; common faint very fine coatings of sand and silt on faces of peds; slightly acid; gradual smooth boundary.

Bw2—26 to 47 inches; very dark grayish brown (10YR 3/2) silty clay loam, brown (10YR 5/3) dry; moderate medium and coarse subangular blocky structure; soft, friable, sticky and plastic; few fine and medium roots; many very fine and fine continuous tubular pores; common faint very fine coatings of sand and silt on faces of peds; slightly acid; gradual smooth boundary.

Bw3—47 to 60 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 5/3) dry; weak medium and coarse subangular blocky structure; soft, friable, sticky and plastic; few fine roots; common very fine and fine continuous tubular and irregular pores; slightly acid.

Depth to bedrock is 60 inches or more.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The upper part of the Bw horizon has hue of 10YR or 7.5YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 2 or 3 moist or dry. The lower part has hue of 10YR or 7.5YR, value of 2 to 4 moist and 4 to 6 dry, and chroma of 2 or 3 moist or dry. The Bw horizon is silt loam or silty clay loam.

The C horizon, where present, is below a depth of 40 inches. It has hue of 10YR, 2.5Y, or 7.5YR, value of 3 or 4 moist and 5 or 6 dry, and chroma of 3 or 4 moist or dry. The horizon is dominantly silty clay loam, but silty clay, silt loam, sandy loam, loamy sand, or sand is in some pedons.

Chimneyrock Series

The Chimneyrock series consists of deep, well drained soils on side slopes. These soils formed in residuum and colluvium derived from conglomerate. Slopes are 30 to 90 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Chimneyrock very gravelly loam, 30 to 60 percent south slopes; 1,600 feet east and 1,750 feet north of the southwest corner of sec. 15, T. 29 S., R. 7 W., W.M.

Oi—1 inch to 0; slightly decomposed needles, twigs, and leaves.

A—0 to 6 inches; dark brown (7.5YR 3/3) very gravelly loam, yellowish brown (10YR 5/4) dry; weak very fine and fine subangular blocky structure parting to weak medium and coarse granular; slightly hard, friable, nonsticky and nonplastic; many medium roots, common very fine and fine roots, and few coarse roots; many very fine irregular pores; 30 percent gravel and 15 percent cobbles; slightly acid; abrupt wavy boundary.

Bt1—6 to 15 inches; brown (7.5YR 4/4) gravelly clay loam, light brown (7.5YR 6/4) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; common very fine tubular pores; few distinct clay films on faces of peds and in pores; 25 percent gravel and 5 percent cobbles; moderately acid; clear smooth boundary.

Bt2—15 to 24 inches; brown (7.5YR 4/4) gravelly clay loam, light brown (7.5YR 6/4) dry; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine, fine, and medium roots and few coarse roots; common very fine tubular pores; common distinct clay films on faces of peds and in pores; 25 percent gravel and 5 percent cobbles; moderately acid; clear smooth boundary.

Bt3—24 to 47 inches; reddish brown (5YR 4/4) extremely cobbly clay loam, light brown (7.5YR 6/4) dry; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common medium roots; few very fine tubular pores; many distinct clay films on faces of peds and in pores; 25 percent gravel and 50 percent cobbles; moderately acid; abrupt smooth boundary.

R—47 inches; Bushnell conglomerate.

Depth to bedrock is 40 to 60 inches.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist and 5 or 6 dry, and chroma of 2 or 3 moist and 2 to 4 dry. It is 35 to 60 percent rock fragments.

The Bt horizon has hue of 7.5YR or 5YR, value of 3 or 4 moist and 5 or 6 dry, and chroma of 3 or 4 moist or dry. The upper part is gravelly clay loam, very gravelly clay loam, or cobbly clay loam, and the lower part is very cobbly clay loam, extremely gravelly clay loam, or extremely cobbly clay loam. The horizon is 20 to 80 percent rock fragments.

Clevescove Series

The Clevescove series consists of deep, well drained soils on side slopes. These soils formed in colluvium and residuum derived from sandstone. Slopes are 30 to 70 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Clevescove loam in an area of Clevescove-Salander complex, 30 to 70 percent slopes; 2,500 feet west and 1,000 feet south of the northeast corner of sec. 34, T. 20 S., R. 12 W.

Oi—3 inches to 0; slightly decomposed bark, needles, and twigs.

A1—0 to 4 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; strong fine and medium granular structure; soft, very friable, slightly sticky and nonplastic; many fine and medium roots and common coarse roots; many very fine and fine tubular and irregular pores; 10 percent sandstone gravel; very strongly acid; clear smooth boundary.

A2—4 to 15 inches; very dark brown (10YR 2/2) loam, brown (10YR 4/3) dry; moderate very fine and fine granular and subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine, fine, and medium tubular and irregular pores;

14 percent sandstone gravel; very strongly acid; gradual smooth boundary.

AB—15 to 31 inches; very dark brown (10YR 2/2) gravelly loam, dark grayish brown (10YR 4/2) dry; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine and fine and common medium tubular pores; 20 percent sandstone gravel; very strongly acid; gradual smooth boundary.

Bw—31 to 50 inches; very dark grayish brown (10YR 3/2) gravelly loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine and fine irregular pores; 15 percent hard sandstone gravel and 10 percent soft fragments; very strongly acid; abrupt smooth boundary.

Cr—50 inches; weathered sandstone.

Depth to bedrock is 40 to 60 inches.

The A horizon has value of 2 or 3 moist and 3 to 5 dry, and it has chroma of 1 or 2 moist and 1 to 3 dry.

The AB horizon has value of 2 or 3 moist and 3 to 5 dry, and it has chroma of 2 or 3 moist or dry. It is gravelly loam or loam.

The Bw horizon has value of 2 to 4 moist and 3 to 5 dry, and it has chroma of 2 to 4 moist or dry. It is gravelly loam, gravelly sandy loam, or sandy loam.

Climax Series

The Climax series consists of moderately deep, moderately well drained soils on footslopes and side slopes (fig. 18, p. 554). These soils formed in colluvium derived from basalt. Slopes are 12 to 60 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Climax clay, 12 to 30 percent slopes; 2,280 feet east and 2,280 feet north of the southwest corner of sec. 19, T. 26 S., R. 5 W.

A—0 to 4 inches; black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; strong very fine granular structure and moderate fine subangular blocky; very hard, very firm, very sticky and very plastic; many very fine roots; many very fine irregular pores; slightly acid; abrupt smooth boundary.

Bss1—4 to 20 inches; black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; moderate fine and medium angular blocky structure; few wedge-shaped aggregates; extremely hard, extremely firm, very sticky and very plastic; many very fine roots; common very fine tubular pores; common pressure faces; few slickensides; slightly acid; clear wavy boundary.

Bss2—20 to 36 inches; black (N 2/0) clay, black (10YR 2/1) dry; massive with distinct wedge-shaped aggregates; extremely hard, extremely firm, very sticky and very plastic; common very fine roots; common very fine tubular pores; many intersecting slickensides; neutral; clear wavy boundary.

Bss3—36 to 39 inches; olive brown (2.5Y 4/3) clay, light olive brown (2.5Y 5/3) dry; massive; very hard, extremely firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; many intersecting slickensides; 60 percent soft weathered gravel; neutral; clear wavy boundary.

2Crt—39 inches; weathered sandstone; many prominent dark reddish brown (5YR 3/3) and yellowish red (5YR 4/6) clay films and many black stains in fractures.

Depth to bedrock is 20 to 40 inches. The profile has cracks that are open for 60 consecutive days or more in summer. It has hue of 2.5Y or 10YR.

The A horizon and the upper part of the Bss horizon have value of 2 or 3 moist and 2 to 4 dry, and they have chroma of 1 or less moist or dry.

The lower part of the Bss horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 2 or 3 moist or dry.

Coburg Series

The Coburg series consists of very deep, moderately well drained soils on flood plains and terraces. These soils formed in mixed alluvium. Slopes are 0 to 5 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Coburg silty clay loam, 0 to 5 percent slopes; 1,800 feet west and 700 feet north of the southeast corner of sec. 28, T. 26 S., R. 6 W.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) silty clay loam, brown (10YR 5/3) dry; moderate fine and medium granular and subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine and fine discontinuous tubular pores; slightly acid; clear smooth boundary.

A2—2 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam, brown (10YR 5/3) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; common fine and medium roots; few very fine and fine discontinuous tubular pores; slightly acid; clear smooth boundary.

Bt1—10 to 27 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark brown (10YR 4/3) dry; weak coarse and very coarse prismatic structure parting to moderate coarse and medium subangular blocky; hard, firm, sticky and plastic; common fine and medium roots; few very fine and fine discontinuous tubular pores; common faint clay films on faces of peds and in pores; common colloidal stains on mineral grains; common organic stains; 7 percent gravel 2 to 10 millimeters in diameter; slightly acid; gradual smooth boundary.

Bt2—27 to 41 inches; dark brown (10YR 3/3) silty clay, dark brown (10YR 4/3) dry; common fine and medium distinct brownish yellow (10YR 6/6) and strong brown (7.5YR 5/6) mottles; weak coarse and very coarse prismatic structure parting to moderate coarse and medium subangular blocky; hard, firm, sticky and very plastic; few fine and medium roots; many very fine and fine discontinuous tubular pores; common distinct clay films on faces of peds and in pores; few medium distinct black (10YR 2/1) manganese stains; 5 percent gravel 2 to 4 millimeters in diameter; common prominent organic stains; slightly acid; clear smooth boundary.

2BCt—41 to 63 inches; dark brown (10YR 3/3) clay loam, dark brown (10YR 4/3) dry; many fine and medium distinct brownish yellow (10YR 6/6) and strong brown (7.5YR 5/6) mottles; moderate medium and coarse subangular blocky structure; slightly hard, firm, sticky and slightly plastic; few fine and medium roots; many very fine and fine discontinuous tubular pores; common distinct clay films on faces of peds and in pores; neutral.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR. Mottles that are a result of wetness are at a depth of more than 20 inches.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bt horizon has value of 3 to 5 moist and 4 to 6 dry, and it has chroma of 2 to 4 moist or dry. It is silty clay loam or silty clay.

The 2BCt horizon has value of 3 to 5 moist and 4 to 6 dry, and it has chroma of 2 to 4 moist or dry. It is fine sandy loam, loam, or clay loam.

Conser Series

The Conser series consists of very deep, poorly drained soils on terraces (fig. 19, p. 555). These soils formed in clayey alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Conser silty clay loam, 0 to 3 percent slopes; 500 feet west and 50 feet north of the southeast corner of sec. 13, T. 25 S., R. 6 W.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 5/2) dry; common medium and fine distinct strong brown (7.5YR 5/6) and light gray (10YR 7/2) mottles; moderate fine and medium subangular blocky structure; slightly hard, firm, sticky and plastic; many fine and very fine roots; many very fine irregular pores; moderately acid; abrupt smooth boundary.

Bw—4 to 11 inches; very dark grayish brown (10YR 3/2) clay, dark grayish brown (10YR 4/2) dry; many medium distinct strong brown (7.5YR 5/6) and gray (10YR 6/1) mottles; strong medium and fine subangular blocky structure; very hard, very firm, very sticky and very plastic; many fine and medium roots and few coarse roots; many fine and very fine tubular pores; moderately acid; clear wavy boundary.

Bg—11 to 33 inches; dark gray (N 4/0) clay, gray (N 5/0) dry; many medium prominent strong brown (7.5YR 5/6), light gray (10YR 7/2), and very dark gray (10YR 3/1) mottles; strong very coarse prismatic structure parting to moderate coarse and very coarse subangular blocky; extremely hard, extremely firm, very sticky and very plastic; common medium roots concentrated along vertical faces of peds; common fine and very fine tubular pores; few prominent black (10YR 2/1) manganese stains; moderately acid; clear smooth boundary.

BCg—33 to 40 inches; gray (N 5/0) clay, gray (N 6/0) dry; many medium and coarse prominent strong brown (7.5YR 5/6) mottles and many medium faint very dark gray (N 3/0) mottles; moderate coarse and very coarse subangular blocky structure; extremely hard, extremely firm, very sticky and very plastic; few fine roots concentrated along vertical faces of peds; common fine and very fine irregular and tubular pores; common prominent black (10YR 2/1) manganese stains; moderately acid; gradual smooth boundary.

Cg—40 to 63 inches; gray (N 5/0) clay, gray (N 6/0) dry; many coarse prominent yellowish brown (10YR 5/8) mottles and many medium faint dark gray (N 4/0) mottles; weak medium and coarse subangular blocky structure; extremely hard, extremely firm, very sticky and very plastic; few fine roots concentrated along vertical faces of peds; common fine irregular pores; common prominent black (10YR 2/1) manganese stains; moderately acid.

Depth to bedrock is 60 inches or more. Mottles that are a result of wetness are throughout the profile.

The A horizon has value of 2 or 3 moist and 3 to 5 dry, and it has chroma of 1 or 2 moist or dry.

The Bg and Cg horizons have hue of 2.5Y or 10YR or they are neutral. They have value of 3 to 5 moist and 4 to 6 dry and chroma of 0 to 2 moist or dry. The horizons are clay or silty clay.

Coquille Series

The Coquille series consists of very deep, very poorly drained soils on flood plains and stream deltas that are subject to tidal fluctuations. These soils formed in mixed alluvium over marine sediment. Slopes are 0 to 1 percent. The mean annual precipitation is about 80 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Coquille silt loam, protected, 0 to 1 percent slopes; 660 feet east and 660 feet north of the southwest corner of sec. 32, T. 21 S., R. 11 W.

Oi—2 inches to 0; slightly decomposed rush and reed plant material.

A1—0 to 5 inches; dark grayish brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; many fine distinct strong brown (7.5YR 4/6) mottles; moderate very fine and fine subangular blocky structure and fine and medium granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many very fine and fine irregular pores; extremely acid; gradual smooth boundary.

A2—5 to 13 inches; dark grayish brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; many fine distinct strong brown (7.5YR 4/6) mottles; weak fine and medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; many very fine and fine roots and common medium roots; many very fine and fine irregular pores; extremely acid; clear smooth boundary.

Cg1—13 to 36 inches; dark gray (2.5Y 4/0) silt loam, light brownish gray (2.5Y 6/2) dry; many fine distinct strong brown (7.5YR 4/6) mottles; massive; soft, friable, sticky and slightly plastic; common very fine and fine roots; many very fine, fine, and medium irregular pores; extremely acid; clear smooth boundary.

2Cg2—36 to 48 inches; very dark gray (5Y 3/1) silt loam, gray (5Y 6/1) dry; few fine faint strong brown (7.5YR 4/6) mottles; massive; slightly hard, friable, sticky and plastic; common fragments of undecomposed and partially decomposed organic material; extremely acid; clear smooth boundary.

2Cg3—48 to 60 inches; very dark gray (5Y 3/1) silty clay loam, gray (5Y 6/1) dry; massive; slightly hard, friable, sticky and plastic; very strongly acid.

Depth to bedrock is 60 inches or more. Depth to stratified marine sediment ranges from 30 to 40 inches. Mottles that are a result of wetness are throughout the profile.

The A horizon has hue of 2.5Y or 10YR, value of 3 or 4 moist and 5 or 6 dry, and chroma of 1 or 2.

The 2Cg horizon has hue of 5Y or 2.5Y, value of 3 or 4 moist and 6 or 7 dry, and chroma of 1 or less moist and 2 or less dry. The horizon is dominantly silt loam or silty clay loam, but it ranges to silty clay in the lower part. In some pedons, the horizon has lenses of fibrous peat that are less than 4 inches thick or it has thin lenses of sand.

The soils in Coquille silt loam, protected, 0 to 1 percent slopes, are a taxadjunct to the Coquille series because they are classified as acid.

Crater Lake Series

The Crater Lake series consists of very deep, well drained soils on side slopes and terraces. These soils formed in volcanic ash. Slopes are 3 to 60 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Crater Lake sandy loam, 3 to 30 percent slopes; 830 feet south and 210 feet west of the northeast corner of sec. 23, T. 30 S., R. 2 W.

Oi—2 inches to 0; slightly decomposed needles and twigs.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) sandy loam, brown (10YR 5/3) dry; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots, common medium roots, and few coarse roots; many very fine irregular pores; 5 percent pumice gravel; slightly acid; clear smooth boundary.

Bw—3 to 24 inches; dark yellowish brown (10YR 4/6) sandy loam, very pale brown (10YR 7/4) dry; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and medium roots and common coarse roots; many very fine irregular pores; 5 percent pumice gravel; slightly acid; abrupt wavy boundary.

C1—24 to 45 inches; yellowish brown (10YR 5/4) sandy loam, light gray (10YR 7/2) dry; massive; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots and few coarse roots; common very fine tubular pores; slightly acid; gradual smooth boundary.

C2—45 to 60 inches; dark yellowish brown (10YR 4/6) sandy loam, light yellowish brown (10YR 6/4) dry; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; common very fine tubular pores; slightly acid.

Depth to bedrock is 60 inches or more. The soil has moist bulk density of less than 1.00 gram per cubic centimeter.

The A horizon has hue of 10YR or 7.5YR, value of 2 to 4 moist and 4 to 6 dry, and chroma of 2 to 4 moist or dry.

The Bw horizon has hue of 10YR or 7.5YR, value of 3 to 5 moist and 5 to 7 dry, and chroma of 4 to 6 moist and 3 or 4 dry. The horizon is sandy loam, fine sandy loam, or very fine sandy loam.

The C horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 4 to 6 moist and 6 to 8 dry, and chroma of 3 to 6 moist and 2 to 4 dry. The horizon is sandy loam, fine sandy loam, or gravelly sandy loam.

Curtin Series

The Curtin series consists of very deep, somewhat poorly drained soils on alluvial fans and footslopes. These soils formed in clayey alluvium and colluvium derived from basalt. Slopes are 3 to 20 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Curtin clay, 3 to 12 percent slopes; 500 feet south and 500 feet east of the northwest corner of sec. 7, T. 27 S., R. 4 W.

A—0 to 5 inches; black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; strong very fine granular structure and moderate fine subangular blocky; very hard, very firm, very sticky and very plastic; many very fine roots; many very fine irregular pores; neutral; clear smooth boundary.

Bss1—5 to 21 inches; black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; weak coarse prismatic structure and moderate fine and very fine subangular blocky; extremely hard, extremely firm, very sticky and very plastic; common very fine roots; common very fine tubular pores; common pressure faces; few slickensides; neutral; clear wavy boundary.

Bss2—21 to 37 inches; very dark grayish brown (10YR 3/2) clay, dark grayish brown (10YR 4/2) dry; common distinct strong brown (7.5YR 5/6) mottles; common black (10YR 2/1) tongues; weak coarse prismatic structure; extremely hard, extremely firm, very sticky and very plastic; few fine roots; common very fine pores; many intersecting slickensides; neutral; gradual wavy boundary.

Bss3—37 to 60 inches; very dark grayish brown (10YR 3/2) clay, dark grayish brown (10YR 4/2) dry; common distinct strong brown (7.5YR 5/6) mottles; massive; extremely hard, extremely firm, very sticky and very plastic; few fine roots; common very fine tubular pores; many intersecting slickensides; neutral.

Depth to bedrock is 60 inches or more. The profile has cracks that are open for 60 consecutive days or more in summer. Mottles that are a result of wetness are at a depth of more than 20 inches.

The A and Bss1 horizons have hue of 2.5Y or 10YR, value of 2 or 3 moist and 3 or 4 dry, and chroma of 1 or less moist or dry.

The Bss2 horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 2 or 3 moist and 3 or 4 dry, and chroma of 2 to 4 moist or dry.

The Bss3 horizon has hue of 2.5Y or 10YR, value of 3 to 5 moist and 4 to 6 dry, and chroma of 2 to 4 moist or dry. Some pedons are stratified below a depth of 40 inches.

Damewood Series

The Damewood series consists of moderately deep, well drained soils on side slopes and ridges. These soils formed in colluvium derived from sandstone. Slopes are 30 to 90 percent. The mean annual precipitation is about 90 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Damewood very gravelly loam in an area of Damewood-Bohannon-Umpcoos complex, 60 to 90 percent slopes; 100 feet west and 400 feet south of the northeast corner of sec. 27, T. 20 S., R. 9 W.

Oi—2 inches to 0; slightly decomposed needles, leaves, and twigs.

A1—0 to 4 inches; very dark brown (10YR 2/2) very gravelly loam, brown (10YR 5/3) dry; moderate fine and medium granular structure; soft, very friable, slightly sticky and nonplastic; many very fine and fine roots and common medium roots; many continuous irregular pores; 40 percent gravel and 5 percent cobbles; strongly acid; clear smooth boundary.

A2—4 to 11 inches; very dark brown (10YR 2/2) very gravelly loam, brown (10YR 5/3) dry; moderate very fine and fine subangular blocky structure parting to granular; soft, friable, sticky and slightly plastic; many very fine and fine roots; many very fine and fine continuous irregular and tubular pores; 30 percent gravel and 15 percent cobbles; strongly acid; clear smooth boundary.

Bw—11 to 29 inches; dark brown (10YR 3/3) extremely gravelly loam, brown (10YR 5/3) dry; weak medium and coarse subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine and fine continuous irregular and tubular pores; 50 percent gravel and 25 percent cobbles; very strongly acid; abrupt smooth boundary.

R—29 inches; sandstone.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 3 to 5 dry, and it has chroma of 2 or 3 moist or dry. It is 35 to 60 percent rock fragments.

The part of the Bw horizon to a depth of 20 inches has value of 2 or 3 moist and 3 to 5 dry, and it has chroma of 2 or 3 moist or dry. The part of the Bw horizon below a depth of 20 inches has value of 2 to 4 moist and 4 or 5 dry, and it has chroma of 2 to 4 moist or dry. The Bw horizon is very gravelly loam, extremely gravelly loam, or very gravelly sandy loam and is 45 to 80 percent rock fragments.

Darby Series

The Darby series consists of very deep, well drained soils on footslopes and side slopes. These soils formed in colluvium and residuum derived from basalt. Slopes are 12 to 60 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Darby silty clay loam, 30 to 60 percent slopes; 2,300 feet north and 450 feet west of the southeast corner of sec. 27, T. 25 S., R. 4 W.

Oi—1 inch to 0; slightly decomposed fern leaves and fir needles and twigs.

A—0 to 5 inches; very dark brown (7.5YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; hard, friable, sticky and plastic; common very fine, fine, and medium roots; many very fine, fine, and medium irregular pores; neutral; abrupt smooth boundary.

BA—5 to 10 inches; very dark brown (7.5YR 2/2) silty clay loam, very dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; hard, friable, sticky and plastic; common very fine, fine, and medium roots; many very fine irregular pores and few fine tubular pores; slightly acid; clear wavy boundary.

Bt1—10 to 19 inches; very dark brown (7.5YR 2/2) silty clay, dark brown (10YR 3/3) dry; strong medium angular and subangular blocky structure; very hard, firm, very sticky and very plastic; common fine and medium roots; many very fine irregular pores and few fine tubular pores; common faint clay films on faces of peds and in pores; neutral; clear wavy boundary.

Bt2—19 to 30 inches; very dark brown (7.5YR 2/2) silty clay, dark brown (10YR 3/3) dry; strong medium angular and subangular blocky structure; extremely hard, firm, very sticky and very plastic; few very fine and fine roots; many very fine and fine irregular pores; many distinct clay films on faces of peds and in pores; neutral; clear wavy boundary.

Bt3—30 to 44 inches; very dark brown (10YR 2/2) silty clay, dark brown (10YR 3/3) dry, dark yellowish brown (10YR 3/4) dry and crushed; strong angular blocky structure; very hard, firm, very sticky and very plastic; common fine and medium roots; many very fine irregular pores; many prominent clay films on faces of peds and in pores; 15 percent fine gravel; neutral; clear smooth boundary.

BCt—44 to 61 inches; dark yellowish brown (10YR 4/4) silty clay loam, yellowish brown (10YR 5/4) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; many very fine pores; few distinct clay films on faces of peds and in pores; 15 percent gravel; neutral; clear smooth boundary.

Cr—61 inches; weathered basalt.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 3 or 4 dry, and it has chroma of 1 to 3 moist or dry.

The upper part of the Bt horizon has value of 2 or 3 moist and 3 or 4 dry, and the lower part has value of 2 to 4 moist and 3 to 5 dry. The horizon has chroma of 1 to 3 moist or dry. It is clay or silty clay.

The BCt horizon is clay loam, loam, or silty clay loam.

Debenger Series

The Debenger series consists of moderately deep, well drained soils on toeslopes, footslopes, side slopes, and ridges. These soils formed in colluvium and residuum derived from sandstone and siltstone. Slopes are 2 to 60 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Debenger loam in an area of Debenger-Brader complex, 30 to 60 percent slopes; 2,400 feet north and 2,000 feet east of the southwest corner of sec. 33, T. 30 S., R. 6 W.

A—0 to 2 inches; dark yellowish brown (10YR 3/4) loam, yellowish brown (10YR 5/4) dry; moderate very fine and fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots and few fine and medium roots; many very fine irregular pores; 3 percent gravel; moderately acid; abrupt smooth boundary.

BA—2 to 11 inches; brown (7.5YR 4/4) loam, yellowish brown (10YR 5/4) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and few fine, medium, and coarse roots; many very fine tubular pores; 2 percent gravel; slightly acid; gradual wavy boundary.

Bw—11 to 26 inches; brown (7.5YR 4/4) loam, light yellowish brown (10YR 6/4) dry; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and few fine, medium, and coarse roots; many very fine tubular pores; 2 percent gravel; moderately acid; abrupt wavy boundary.

Cr—26 inches; weathered sandstone.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 3 or 4 moist and 5 or 6 dry, and it has chroma of 2 to 4 moist or dry.

The Bw horizon has value of 4 to 6 dry and chroma of 3 to 6 dry. It is clay loam or loam.

Dicecreek Series

The Dicecreek series consists of shallow, well drained soils on side slopes. These soils formed in colluvium and residuum derived from sandstone and siltstone. Slopes are 30 to 60 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Dicecreek loam in an area of Dicecreek-Bellpine-Windygap complex, 30 to 60 percent south slopes; 1,600 feet west and 650 feet north of the southeast corner of sec. 23, T. 29 S., R. 8 W., W.M.

Oi—0.5 inch to 0; slightly decomposed needles and twigs.

A—0 to 3 inches; dark brown (7.5YR 3/3) loam, yellowish brown (10YR 5/4) dry; moderate very fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots and few fine, medium, and coarse roots; many very fine irregular pores; 13 percent gravel; slightly acid; clear smooth boundary.

Bw—3 to 12 inches; dark brown (7.5YR 3/4) gravelly silty clay loam, brown (7.5YR 5/4) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine, fine, medium, and coarse roots; many very fine tubular pores; 15 percent gravel; very strongly acid; clear wavy boundary.

R—12 inches; highly fractured, interbedded siltstone and sandstone; common faint clay films in fractures.

Depth to bedrock is 10 to 20 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 3 or 4 moist and 5 or 6 dry, and it has chroma of 3 or 4 dry.

The Bw horizon has value of 3 to 5 moist and 5 to 7 dry, and it has chroma of 4 to 6 moist or dry. It is clay loam, gravelly clay loam, or gravelly silty clay loam.

Dickerson Series

The Dickerson series consists of very shallow, well drained soils on ridges, side slopes, and headwalls. These soils formed in residuum and colluvium derived from sandstone, siltstone, and conglomerate. Slopes are 3 to 90 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Dickerson loam, 3 to 30 percent slopes; 1,470 feet west of the southeast corner of sec. 13, T. 27 S., R. 7 W.

A1—0 to 2 inches; dark yellowish brown (10YR 3/4) loam, yellowish brown (10YR 5/4) dry; strong very fine and fine granular structure; slightly hard, very friable, slightly sticky and nonplastic; many very fine and fine roots; many very fine and fine continuous tubular pores; moderately acid; clear smooth boundary.

A2—2 to 5 inches; dark brown (10YR 4/3) loam, light yellowish brown (10YR 6/4) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine continuous tubular pores; common faint very fine coatings of sand and silt on faces of peds and in pores; moderately acid; abrupt smooth boundary.

R—5 inches; sandstone; few faint coatings of clean very fine sand and silt grains on surfaces of fractures; very fine and fine roots penetrate fractures.

Depth to bedrock is 5 to 10 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 3 or 4 moist and 5 to 7 dry, and it has chroma of 3 or 4 moist or dry.

Digger Series

The Digger series consists of moderately deep, well drained soils on side slopes and ridges. These soils formed in colluvium and residuum derived from sandstone and siltstone. Slopes are 3 to 90 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Digger very gravelly loam in an area of Fernhaven-Digger complex, 30 to 60 percent slopes; 1,520 feet north and 660 feet east of the southwest corner of sec. 35, T. 20 S., R. 6 W.

Oi—2 inches to 0; slightly decomposed needles, twigs, leaves, ferns, and mosses.

A1—0 to 6 inches; very dark grayish brown (10YR 3/2) very gravelly loam, brown (10YR 5/3) dry; moderate very fine and fine granular structure; soft, very friable, slightly sticky and nonplastic; many very fine and fine roots and common medium roots; many very fine and fine irregular pores; 60 percent gravel; strongly acid; clear smooth boundary.

A2—6 to 11 inches; dark brown (10YR 3/3) very gravelly loam, pale brown (10YR 6/3) dry; moderate very fine and fine subangular blocky structure parting to fine granular; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots and few medium roots; many very fine and fine continuous tubular and irregular pores; 50 percent gravel and 5 percent cobbles; strongly acid; clear smooth boundary.

Bw1—11 to 19 inches; dark brown (10YR 4/3) very gravelly loam, light yellowish brown (10YR 6/4) dry; moderate medium and coarse subangular blocky structure; soft, friable, sticky and slightly plastic; common very fine and fine roots; many very fine and fine continuous tubular and irregular pores; few faint coatings of very fine sand and silt on faces of peds and in pores; 30 percent gravel and 10 percent cobbles; very strongly acid; clear smooth boundary.

Bw2—19 to 28 inches; dark brown (10YR 4/3) very gravelly loam, light yellowish brown (10YR 6/4) dry; weak medium and coarse subangular blocky structure; soft, friable, sticky and slightly plastic; few fine roots; many very fine and fine continuous irregular and tubular pores; few faint very fine sand and silt coatings on faces of peds and in pores; 45 percent gravel and 10 percent cobbles; very strongly acid; abrupt wavy boundary.

Cr—28 inches; weathered sandstone.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 5 or 6 dry, and it has chroma of 2 or 3 moist or dry. It is 40 to 60 percent rock fragments.

The Bw horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 3 or 4 moist or dry. It is very gravelly loam, very cobbly loam, or very gravelly silt loam and is 35 to 60 percent rock fragments.

Dixonville Series

The Dixonville series consists of moderately deep, well drained soils on toeslopes, footslopes, side slopes, and ridges. These soils formed in colluvium and residuum derived from basalt. Slopes are 3 to 60 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Dixonville silty clay loam in an area of Philomath-Dixonville complex, 3 to 30 percent slopes; 2,500 feet west and 900 feet south of the northeast corner of sec. 20, T. 26 S., R. 5 W.

A1—0 to 2 inches; dark brown (7.5YR 3/2) silty clay loam, brown (10YR 4/3) dry; strong fine and medium subangular blocky structure; slightly hard, firm, sticky and plastic; common very fine and fine roots; many very fine discontinuous tubular pores; moderately acid; clear smooth boundary.

A2—2 to 8 inches; dark brown (7.5YR 3/2) silty clay loam, brown (7.5YR 4/3) dry; moderate fine and medium subangular blocky structure; slightly hard, firm, sticky and plastic; common very fine and fine roots; many very fine discontinuous tubular pores; moderately acid; clear smooth boundary.

Bt1—8 to 16 inches; dark brown (7.5YR 3/2) silty clay, brown (7.5YR 4/3) dry; moderate fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; common fine and very fine roots; many very fine and fine discontinuous tubular pores; few thin clay films and common thin organic coatings on faces of peds and in pores; slightly acid; gradual smooth boundary.

Bt2—16 to 31 inches; dark brown (7.5YR 3/2) clay, brown (7.5YR 4/3) dry; moderate medium and coarse subangular blocky structure; hard, firm, very sticky and very plastic; few very fine roots; few very fine and fine discontinuous tubular pores; few distinct clay films and common faint organic coatings on faces of peds and in pores; 5 percent basalt gravel 2 to 4 millimeters in diameter; slightly acid; abrupt smooth boundary.

Crt—31 inches; weathered basalt; common prominent very dark brown (10YR 2/2) coatings in fractures; many large manganese stains; few very fine roots in fractures.

Depth to bedrock is 20 to 40 inches.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 moist and 3 or 4 dry, and chroma of 2 or 3 moist or dry.

The Bt horizon has hue of 7.5YR or 5YR, value of 2 or 3 moist and 3 or 4 dry, and chroma of 2 to 4 moist or dry. The horizon is clay, silty clay, or cobbly clay.

Dompier Series

The Dompier series consists of soils that are moderately deep to a fragipan and more than 60 inches deep to bedrock. These soils are somewhat poorly drained and are on side slopes. They formed in residuum and colluvium derived from mica schist. Slopes are 30 to 60 percent. The mean annual precipitation is about 50 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Dompier silt loam in an area of Dompier-Zing-Beal complex, 30 to 60 percent slopes; 1,200 feet south of the northeast corner of sec. 8, T. 31 S., R. 3 W., W.M.

Oi—2 inches to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 6 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate fine and medium granular structure; hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; strongly acid; clear wavy boundary.

AB—6 to 16 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate fine subangular blocky structure; hard, firm, sticky and slightly plastic; many very fine, fine, and medium roots; few medium irregular pores; strongly acid; clear wavy boundary.

Bt—16 to 24 inches; dark brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; common fine faint brown (10YR 5/3) mottles, yellowish brown (10YR 5/4) dry; moderate medium subangular blocky structure; hard, friable, sticky and slightly plastic; common very fine and fine roots and few medium roots; many very fine and few medium irregular pores; few faint clay films on faces of peds and in pores; moderately acid; clear wavy boundary.

Btg—24 to 32 inches; gray (10YR 5/1) silty clay loam, light brownish gray (10YR 6/2) dry; many medium distinct dark grayish brown (10YR 4/2) mottles, light gray (10YR 6/1) and yellowish brown (10YR 5/4) dry; strong medium and coarse subangular blocky structure; very hard, very firm, sticky and plastic; common very fine and fine roots along faces of peds; many very fine irregular pores; common distinct clay films on faces of peds and in pores; slightly acid; abrupt wavy boundary.

Btx—32 to 60 inches; dark yellowish brown (10YR 3/6) silt loam, light yellowish brown (10YR 6/4) dry; 45 percent light olive brown (2.5Y 5/4) mottles, light gray (2.5Y 7/2) dry, and 15 percent dark yellowish brown (10YR 4/6) mottles, yellowish brown (10YR 5/6) dry; strong very coarse prismatic structure; extremely hard, extremely firm, brittle, sticky and plastic; very few very fine roots along faces of peds in upper 6 inches; many fine irregular pores; common distinct clay films on faces of peds and in pores; neutral.

Depth to the fragipan is 20 to 40 inches. Depth to bedrock is 60 inches or more. Mottles as a result of wetness are below a depth of 20 inches.

The A horizon has hue of 2.5Y or 10YR, value of 2 to 4 moist and 5 or 6 dry, and chroma of 2 to 4 moist or dry.

The Bt horizon has hue of 2.5Y or 10YR, value of 4 or 5 moist and 6 or 7 dry, and chroma of 1 to 3 moist or dry. The horizon is silt loam or silty clay loam.

The matrix of the Btx horizon has hue of 2.5Y or 10YR, value of 3 to 5 moist and 6 to 8 dry, and chroma of 4 to 6 moist or dry. The horizon is loam or silt loam.

Dubakella Series

The Dubakella series consists of moderately deep, well drained soils on ridges and side slopes (fig. 20, p. 555). These soils formed in colluvium and residuum derived from serpentinite and peridotite. Slopes are 5 to 70 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of Dubakella very stony clay loam in an area of Pearsoll-Dubakella complex, 30 to 70 percent south slopes; 2,600 feet south and 1,200 feet west of the northeast corner of sec. 20, T. 30 S., R. 6 W.

A—0 to 3 inches; dark reddish brown (2.5YR 3/4) very stony clay loam, dark reddish brown (5YR 3/3) dry; moderate very fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine, common fine, and few medium and coarse roots; many very fine irregular pores; 10 percent gravel, 10 percent cobbles, and 15 percent stones; neutral; abrupt smooth boundary.

Bt1—3 to 19 inches; dark reddish brown (2.5YR 3/4) very cobbly clay, dark reddish brown (5YR 3/4) dry; strong very fine and fine subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots and few medium and coarse roots; many very fine tubular pores; many distinct clay films on faces of peds and in pores; 10 percent gravel, 35 percent cobbles, and 15 percent stones; neutral; gradual wavy boundary.

Bt2—19 to 33 inches; dark reddish brown (2.5YR 3/4) very cobbly clay, dark reddish brown (5YR 3/4) dry; strong very fine and fine subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots and few medium and coarse roots; many very fine tubular pores; continuous distinct clay films on faces of peds and in pores; 10 percent gravel, 35 percent cobbles, and 15 percent stones; neutral; abrupt irregular boundary.

R—33 inches; serpentinitic bedrock.

Depth to bedrock is 20 to 40 inches. The profile has hue of 7.5YR, 5YR, or 2.5YR.

The A horizon has value of 3 or 4 moist and 3 to 5 dry, and it has chroma of 2 to 4 moist or dry. It is 35 to 50 percent rock fragments. As much as 15 percent of the surface is covered with stones.

The Bt horizon has value of 3 or 4 moist and 3 to 5 dry, and it has chroma of 3 or 4 moist or dry. It is very gravelly clay loam, very gravelly clay, or very cobbly clay and is 35 to 75 percent rock fragments.

Dumont Series

The Dumont series consists of very deep, well drained soils on toeslopes, footslopes, side slopes, and ridges. These soils formed in residuum and colluvium derived from granodiorite and metamorphic rock. Slopes are 2 to 60 percent. The mean annual precipitation is about 50 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Dumont gravelly loam, 12 to 30 percent slopes; 1,200 feet west and 200 feet south of the northeast corner of sec. 29, T. 31 S., R. 7 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 8 inches; dark brown (7.5YR 3/4) gravelly loam, brown (7.5YR 5/4) dry; strong fine granular structure; slightly hard, friable, slightly sticky and plastic; many very fine, fine, and medium roots and few coarse roots; many fine irregular pores; 20 percent gravel; slightly acid; abrupt smooth boundary.

Bw—8 to 16 inches; yellowish red (5YR 4/6) clay loam, light reddish brown (5YR 6/4) dry; strong medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine and fine roots, common medium roots, and few coarse roots; many fine irregular and tubular pores; 10 percent gravel; moderately acid; clear smooth boundary.

Bt—16 to 40 inches; red (2.5YR 4/6) clay, red (2.5YR 5/6) dry; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots and few medium roots; many very fine tubular pores; common distinct clay films on faces of peds and in pores; 10 percent gravel; few prominent manganese stains; moderately acid; clear smooth boundary.

BCt—40 to 70 inches; red (2.5YR 4/6) clay loam, red (2.5YR 5/8) dry; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; many very fine tubular pores; few distinct clay films on faces of peds and in pores; 10 percent gravel; few prominent manganese stains; moderately acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 2 or 3 moist and 3 to 5 dry in the upper part and 5 or 6 moist or dry in the lower part, and chroma of 2 to 4 moist or dry.

The Bt horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 3 or 4 moist and 3 to 6 dry, and chroma of 4 to 6 moist and 4 to 7 dry. The horizon is clay or silty clay.

Dupee Series

The Dupee series consists of very deep, somewhat poorly drained soils on toeslopes, footslopes, and side slopes and in swales. These soils formed in residuum and colluvium derived from sandstone and siltstone. Slopes are 3 to 30 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Dupee silty clay loam, 12 to 30 percent slopes; 2,150 feet east and 2,450 feet north of the southwest corner of sec. 23, T. 24 S., R. 6 W.

A1—0 to 3 inches; dark brown (10YR 3/3) silty clay loam, yellowish brown (10YR 5/4) dry; few fine faint dark grayish brown (10YR 4/2) mottles; moderate medium and coarse subangular blocky structure parting to fine and medium subangular blocky; hard, firm, sticky and plastic; many very fine and fine roots and few medium roots; common very fine continuous tubular pores; moderately acid; clear smooth boundary.

A2—3 to 9 inches; dark brown (10YR 3/3) silty clay loam, yellowish brown (10YR 5/4) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; common fine and medium roots; many very fine and fine continuous tubular pores; common faint organic coatings on faces of peds and in pores; moderately acid; clear smooth boundary.

BAt—9 to 19 inches; dark brown (10YR 3/3) silty clay, yellowish brown (10YR 5/4) dry; moderate medium and coarse subangular blocky structure parting to fine and medium subangular blocky; hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine and fine continuous tubular pores; common thin organic stains; very few faint clay films on faces of peds and in pores; strongly acid; clear smooth boundary.

Bt1—19 to 30 inches; dark brown (7.5YR 4/4) silty clay, yellowish brown (10YR 5/4) dry; common fine and medium distinct strong brown (7.5YR 4/6) and yellowish brown (10YR 5/6) mottles, and few fine faint dark grayish brown (10YR 4/2) mottles in root channels; moderate fine and medium subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine and fine roots; common very fine and fine continuous tubular pores; many distinct clay films on faces of peds and in pores; strongly acid; abrupt smooth boundary.

2Bt2—30 to 50 inches; dark brown (7.5YR 4/4) clay, yellowish brown (10YR 5/4) dry, dark yellowish brown (10YR 4/4) crushed; many fine and medium distinct strong brown (7.5YR 4/6) and yellowish brown (10YR 5/6) mottles, and few fine distinct light brownish gray (10YR 6/2) and gray (N 5/0) mottles concentrated in root channels and pores; weak coarse and very coarse prismatic structure parting to medium and coarse angular blocky; extremely hard, extremely firm, very sticky and very plastic; few very fine roots concentrated along faces of peds; few very fine discontinuous tubular pores; many distinct dark brown (7.5YR 4/4) clay films on faces of peds and in pores; very dark gray (10YR 3/1) manganese stains; very strongly acid; clear smooth boundary.

3BCt—50 to 63 inches; mottled, yellowish brown (10YR 5/6), strong brown (7.5YR 4/6), and yellowish red (5YR 4/6) clay; many fine distinct light brownish gray (10YR 6/2) and gray (N 5/0) mottles concentrated along root channels; weak coarse and very coarse prismatic structure parting to medium and coarse angular blocky; extremely hard, extremely firm, very sticky and very plastic; few very fine roots concentrated along faces of peds; few very fine discontinuous tubular pores; many distinct dark brown (7.5YR 4/4) clay films; 25 percent soft siltstone gravel; very dark gray (10YR 3/1) manganese stains; very strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR. Mottles that are a result of wetness are within 30 inches of the surface.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 to 4 moist or dry.

The Bt horizon has value of 4 or 5 moist and 5 or 6 dry, and it has chroma of 3 or 4 moist or dry. It is silty clay loam, silty clay, or clay. The lower part of the horizon is 0 to 50 percent soft rock fragments.

Edenbower Series

The Edenbower series consists of very shallow, well drained soils on ridges and side slopes. These soils formed in residuum and colluvium derived from basalt. Slopes are 3 to 60 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Edenbower clay, 3 to 30 percent slopes; 1,400 feet east and 700 feet north of the southwest corner of sec. 19, T. 26 S., R. 5 W.

A1—0 to 2 inches; very dark brown (10YR 2/2) clay, very dark grayish brown (10YR 3/2) dry; moderate very fine and fine granular structure and fine subangular blocky; hard, firm, very sticky and very plastic; many very fine and fine roots; common fine discontinuous irregular pores; slightly acid; clear smooth boundary.

A2—2 to 8 inches; very dark brown (10YR 2/2) clay, very dark grayish brown (10YR 3/2) dry; moderate coarse prismatic structure parting to strong very fine and fine granular and fine subangular blocky structure; very hard, very firm, very sticky and very plastic; common very fine and fine roots; common fine discontinuous irregular pores; 5 percent basalt gravel; common wormcasts; common pressure faces; slightly acid; abrupt smooth boundary.

R—8 inches; basalt; common distinct to prominent very dark brown (10YR 2/2) clay films in fractures; common fine roots in fractures to a depth of 31 inches.

Depth to bedrock is 4 to 10 inches. The soils have cracks that are open for 60 consecutive days or more in summer. The profile has hue of 10YR or 7.5YR.

The A horizon has chroma of 1 to 3 moist or dry.

Eightlar Series

The Eightlar series consists of very deep, well drained soils on alluvial fans. These soils formed in alluvium derived from serpentinitic rock. Slopes are 5 to 20 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 53 degrees F.

Typical pedon of Eightlar very gravelly silty clay loam, 5 to 20 percent slopes; 4,200 feet south and 400 feet east of the northwest corner of sec. 32, T. 29 S., R. 5 W.

A—0 to 3 inches; very dark brown (10YR 2/2) very gravelly silty clay loam, very dark grayish brown (10YR 3/2) dry; moderate medium and coarse granular structure; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine irregular pores; 35 percent gravel; moderately acid; abrupt smooth boundary.

Bt1—3 to 12 inches; very dark brown (10YR 2/2) very gravelly clay, very dark grayish brown (10YR 3/2) dry; strong fine and medium subangular blocky structure; hard, friable, sticky and plastic; many very fine and common fine roots; many very fine tubular pores; common faint clay films on faces of peds and in pores; 40 percent gravel; slightly acid; clear smooth boundary.

Bt2—12 to 35 inches; very dark brown (10YR 2/2) very gravelly clay, very dark grayish brown (10YR 3/2) dry; strong fine and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and few fine roots; common very fine tubular pores; many distinct clay films on faces of peds and in pores; 40 percent gravel; slightly acid; abrupt wavy boundary.

2Bt3—35 to 42 inches; dark yellowish brown (10YR 3/4) very cobbly sandy clay, dark yellowish brown (10YR 4/4) dry; moderate fine and medium subangular blocky structure; slightly hard, very friable, sticky and plastic; few very fine and fine roots; common very fine tubular pores; many distinct clay films on faces of peds and in pores; 30 percent gravel and 25 percent cobbles; neutral; clear wavy boundary.

2Bt4—42 to 60 inches; dark yellowish brown (10YR 3/4) very cobbly sandy clay, dark yellowish brown (10YR 4/4) dry; weak fine and medium granular structure; slightly hard, very friable, sticky and plastic; few very fine and fine roots; common very fine tubular pores; common distinct clay films on faces of peds and in pores; 30 percent gravel and 25 percent cobbles; neutral.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 moist and 3 or 4 dry, and chroma of 2 or 3 moist and 3 or 4 dry. The horizon is 35 to 55 percent rock fragments.

The Bt horizon has value of 2 or 3 moist and 3 to 5 dry, and it has chroma of 2 to 4 moist or dry. It is 35 to 60 percent rock fragments.

The 2Bt horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 3 or 4 moist or dry. It is very cobbly sandy clay, extremely stony clay, or extremely cobbly clay and is 45 to 75 percent rock fragments.

The Eightlar soils in this survey area are a taxadjunct to the Eightlar series because they have a mollic epipedon and an argillic horizon. They are classified as Ultic Argixerolls.

Evans Series

The Evans series consists of very deep, well drained soils on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Evans loam, 0 to 3 percent slopes; 1,300 feet east and 2,100 feet south of the northwest corner of sec. 4, T. 27 S., R. 6 W.

A1—0 to 10 inches; very dark grayish brown (10YR 3/2) loam, dark brown (10YR 4/3) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine discontinuous and continuous irregular pores; neutral; clear smooth boundary.

A2—10 to 27 inches; very dark grayish brown (10YR 3/2) loam, dark brown (10YR 4/3) dry; weak medium and coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine discontinuous irregular pores; slightly acid; gradual smooth boundary.

AC—27 to 43 inches; very dark grayish brown (10YR

3/2) very fine sandy loam, dark brown (10YR 4/3) dry; weak medium, coarse, and very coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common very fine and fine discontinuous irregular pores; slightly acid; clear smooth boundary.

C—43 to 63 inches; dark brown (10YR 4/3) very fine sandy loam, brown (10YR 5/3) dry; massive; soft, very friable, slightly sticky and nonplastic; common very fine and fine roots; many fine discontinuous irregular pores; slightly acid.

Depth to bedrock is 60 inches or more.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist and 2 to 4 dry.

The AC and C horizons have value of 3 or 4 moist and 4 to 6 dry, and they have chroma of 2 or 3 moist and 2 to 4 dry. They are loam, silt loam, or very fine sandy loam.

Fernhaven Series

The Fernhaven series consists of very deep, well drained soils on side slopes and ridges. These soils formed in colluvium and residuum derived from sandstone and siltstone. Slopes are 3 to 75 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of Fernhaven gravelly loam, 30 to 50 percent slopes; 2,100 feet east and 1,750 feet north of the southwest corner of sec. 3, T. 21 S., R. 6 W.

Oi—4 inches to 0; slightly decomposed twigs, needles, leaves, and roots.

A1—0 to 4 inches; dark brown (10YR 3/3) gravelly loam, yellowish brown (10YR 5/4) dry; moderate fine and medium granular structure; soft, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine irregular pores; 15 percent gravel; strongly acid; clear smooth boundary.

A2—4 to 12 inches; dark yellowish brown (10YR 4/4) gravelly loam, pale brown (10YR 6/3) dry; moderate very fine and fine subangular blocky structure and fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many very fine and fine irregular pores; 15 percent gravel; strongly acid; clear smooth boundary.

BAt—12 to 21 inches; dark brown (7.5YR 4/4) loam, light yellowish brown (10YR 6/4) dry; moderate medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; common very fine and fine roots; many fine and medium continuous tubular pores; few faint strong brown (7.5YR 4/6) clay films on faces of peds and in pores; 10 percent gravel; strongly acid; clear smooth boundary.

Bt1—21 to 31 inches; dark brown (7.5YR 4/4) loam, light yellowish brown (10YR 6/4) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and slightly plastic; few fine roots; many very fine and fine continuous tubular pores; common distinct strong brown (7.5YR 4/6) clay films on faces of peds and in pores; 10 percent soft gravel and 10 percent hard gravel; very strongly acid; clear smooth boundary.

Bt2—31 to 50 inches; strong brown (7.5YR 4/6) clay loam, light yellowish brown (10YR 6/4) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; few fine roots; common very fine and fine continuous tubular pores; many distinct strong brown (7.5YR 4/6) clay films on faces of peds, in pores, and on surfaces of coarse fragments; 15 percent soft gravel and 10 percent hard gravel; very strongly acid; clear smooth boundary.

Bt3—50 to 63 inches; dark yellowish brown (10YR 4/6) clay loam, light yellowish brown (10YR 6/4) dry; weak medium and coarse subangular blocky structure; hard, firm, sticky and plastic; very few very fine roots; common fine continuous tubular pores; common distinct brown (7.5YR 4/4) clay films on faces of peds and in pores; 10 percent gravel; very strongly acid; clear smooth boundary.

BCt—63 to 72 inches; dark yellowish brown (10YR 4/6) loam, brownish yellow (10YR 6/6) dry; massive; soft, very friable, slightly sticky and slightly plastic; few prominent clay films on surfaces of weathered gravel; 10 percent gravel; very strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 3 or 4 moist and 5 to 7 dry, and it has chroma of 3 to 6 moist or dry.

The Bt horizon has value of 4 or 5 moist and 5 to 7 dry, and it has chroma of 3 to 6 moist or dry. It is gravelly loam, loam, or clay loam.

The BCt horizon has value of 4 or 5 moist and 5 to 7 dry, and it has chroma of 3 to 6 moist or dry. It is loam or gravelly loam.

Foehlin Series

The Foehlin series consists of very deep, well drained soils on alluvial fans and terraces. These soils formed in mixed alluvium. Slopes are 0 to 12 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Foehlin gravelly loam, 0 to 3 percent slopes; 3,300 feet north and 1,200 west of the southeast corner of sec. 25, T. 30 S., R. 4 W.

A—0 to 5 inches; very dark grayish brown (10YR 3/2) gravelly loam, dark brown (10YR 4/3) dry; moderate very fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; many very fine tubular pores; 15 percent gravel; slightly acid; clear smooth boundary.

AB—5 to 12 inches; dark brown (10YR 3/3) gravelly loam, brown (10YR 4/3) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and few fine and medium roots; many very fine irregular pores; 15 percent gravel; slightly acid; clear smooth boundary.

Bt1—12 to 22 inches; dark yellowish brown (10YR 3/4) gravelly clay loam, yellowish brown (10YR 5/4) dry; strong fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine roots and few fine and medium roots; many very fine tubular pores; common faint clay films on faces of peds and in pores; 15 percent gravel; slightly acid; clear smooth boundary.

Bt2—22 to 35 inches; dark yellowish brown (10YR 3/4) gravelly clay loam, yellowish brown (10YR 5/4) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; few faint clay films on faces of peds and in pores; 30 percent gravel; slightly acid; clear smooth boundary.

C—35 to 60 inches; dark yellowish brown (10YR 3/4) gravelly clay loam, yellowish brown (10YR 5/4) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine tubular pores; 30 percent gravel; slightly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bt and C horizons have value of 3 or 4 moist and 5 or 6 dry, and they have chroma of 3 or 4 moist or dry. They are clay loam or gravelly clay loam.

Fordice Series

The Fordice series consists of very deep, well drained soils on terraces. These soils formed in mixed alluvium. Slopes are 0 to 12 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Fordice very cobbly loam, 0 to 12 percent slopes; 1,000 feet west and 660 feet north of the southeast corner of sec. 14, T. 26 S., R. 4 W.

A1—0 to 6 inches; dark brown (7.5YR 3/2) very cobbly loam, brown (10YR 5/3) dry; strong fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine continuous irregular and tubular pores; 25 percent gravel and 20 percent cobbles; strongly acid; clear smooth boundary.

A2—6 to 13 inches; dark brown (7.5YR 3/2) very cobbly loam, brown (10YR 5/3) dry; moderate fine and medium granular and subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine continuous irregular and tubular pores; 20 percent gravel and 30 percent cobbles; strongly acid; clear smooth boundary.

BAt—13 to 19 inches; dark brown (7.5YR 3/4) extremely cobbly loam, brown (7.5YR 5/4) dry; moderate fine and medium subangular blocky structure; hard, firm, sticky and slightly plastic; common very fine and fine roots; many very fine and fine continuous irregular and tubular pores; few distinct strong brown (7.5YR 4/6) clay films on faces of peds and in pores; 40 percent gravel and 20 percent cobbles; moderately acid; clear smooth boundary.

Bt1—19 to 35 inches; dark brown (7.5YR 4/4) extremely gravelly clay loam, strong brown (7.5YR 5/6) dry; weak medium and coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots; many very fine and fine continuous tubular pores; many distinct strong brown (7.5YR 4/6) clay films on faces of peds, in pores, and on rock fragments; common medium distinct black (10YR 2/1) stains on faces of peds; 50 percent gravel and 20 percent cobbles; moderately acid; clear smooth boundary.

Bt2—35 to 56 inches; dark brown (7.5YR 4/4) extremely cobbly clay loam, strong brown (7.5YR

5/6) dry; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots; many fine and medium continuous tubular pores; many distinct strong brown (7.5YR 4/6) clay films on faces of peds, in pores, and on rock fragments; many medium distinct black (10YR 2/1) stains on faces of peds and on rock fragments; 40 percent gravel and 35 percent cobbles; moderately acid; clear smooth boundary.

BCt—56 to 63 inches; dark brown (7.5YR 4/4) extremely cobbly loam, strong brown (7.5YR 5/6) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many fine and medium continuous tubular pores; many distinct strong brown (7.5YR 4/6) clay films on faces of peds, in pores, and on rock fragments; many medium distinct black (10YR 2/1) stains on faces of peds and on rock fragments; 40 percent gravel and 30 percent cobbles; moderately acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry. It is 40 to 60 percent rock fragments.

The Bt horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 4 to 6 moist or dry. It is extremely cobbly loam, extremely cobbly clay loam, or extremely gravelly clay loam and is 40 to 80 percent rock fragments.

Gardiner Series

The Gardiner series consists of very deep, well drained soils on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Gardiner fine sandy loam in an area of Nekoma-Gardiner complex, 0 to 3 percent slopes; 525 feet west and 1,890 feet north of the southeast corner of sec. 31, T. 20 S., R. 10 W.

Ap—0 to 8 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; specks of grayish brown and light brownish gray uncoated sand grains; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; many fine roots; many very fine and fine irregular pores; strongly acid; clear wavy boundary.

C—8 to 60 inches; dark yellowish brown (10YR 3/4) loamy fine sand, yellowish brown (10YR 5/4) dry; many specks of grayish brown, light brownish gray, and light gray uncoated sand grains; single grain; loose; common roots in upper part of horizon, decreasing markedly with depth; many very fine and fine irregular pores; strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has value of 4 or 5 dry and chroma of 2 or 3 moist or dry.

The C horizon has value of 3 or 4 moist and 5 or 6 dry, and it has chroma of 3 or 4 moist or dry. It is loamy fine sand or loamy sand. Thin lenses of finer textured material are in some pedons. The horizon is fine sand to gravelly or very gravelly sand below a depth of 40 inches in some pedons.

Glide Series

The Glide series consists of very deep, well drained soils on flood plains. These soils formed in ashy alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Glide fine sandy loam, 0 to 3 percent slopes; 1,300 feet north and 400 feet west of the southeast corner of sec. 13, T. 26 S., R. 4 W.

A1—0 to 5 inches; black (10YR 2/1) fine sandy loam, very dark grayish brown (10YR 3/2) dry; moderate very fine granular structure; very soft, very friable, slightly sticky and nonplastic; many very fine and fine roots; many very fine and fine continuous interstitial and tubular pores; 10 percent weathered pumice fragments 2 to 20 millimeters in diameter; moderately acid; clear smooth boundary.

A2—5 to 12 inches; black (10YR 2/1) gravelly sandy loam, very dark grayish brown (10YR 3/2) dry; moderate fine and medium granular structure parting to very fine and fine granular; very soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine continuous interstitial and tubular pores; 20 percent weathered pumice fragments 2 to 20 millimeters in diameter; slightly acid; clear smooth boundary.

AC—12 to 22 inches; black (10YR 2/1) gravelly loamy sand, very dark grayish brown (10YR 3/2) dry; single grain; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many fine and medium interstitial pores; 25 percent pumice fragments 2 to 20 millimeters in diameter; slightly acid; gradual wavy boundary.

C1—22 to 36 inches; very dark brown (10YR 2/2) gravelly loamy sand, dark brown (10YR 4/3) dry;

single grain; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many fine and medium interstitial pores; 25 percent pumice fragments 2 to 20 millimeters in diameter; slightly acid; gradual wavy boundary.

C2—36 to 59 inches; dark brown (10YR 3/3) gravelly sand, dark brown (10YR 4/3) dry; many fine and medium faint strong brown (7.5YR 4/6) mottles; single grain; loose; common very fine and fine roots; many fine and medium interstitial pores; 30 percent pumice fragments 2 to 20 millimeters in diameter; slightly acid; clear wavy boundary.

C3—59 to 63 inches; dark yellowish brown (10YR 4/4) gravelly loamy sand; many fine and medium strong brown (7.5YR 5/6) mottles and few fine faint grayish brown (10YR 5/2) mottles; single grain; loose; few very fine roots; many fine and medium interstitial pores; 15 percent pumice fragments 2 to 10 millimeters in diameter; neutral.

Depth to bedrock is 60 inches or more. Thickness of the mollic epipedon is 20 to 40 inches. The moist bulk density is 1.00 gram per cubic centimeter.

The A horizon has value of 2 or 3 moist and 3 or 4 dry, and it has chroma of 1 or 2 moist or dry.

The AC horizon has value of 2 or 3 moist and 3 or 4 dry, and it has chroma of 1 or 2 moist or dry. It is gravelly sandy loam or gravelly loamy sand.

The C horizon has hue of 10YR or 7.5YR, value of 2 to 4 moist and 3 to 5 dry, and chroma of 2 to 4 moist or dry. The horizon is gravelly loamy sand or gravelly sand.

Gravecreek Series

The Gravecreek series consists of moderately deep, well drained soils on side slopes and ridges. These soils formed in colluvium derived from serpentinitic rock. Slopes are 12 to 80 percent. The mean annual precipitation is about 50 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Gravecreek gravelly loam, 30 to 60 percent south slopes; 500 feet east and 800 feet south of the northwest corner of sec. 25, T. 32 S., R. 4 W.

Oi—1 inch to 0; slightly decomposed needles, twigs, moss, and roots.

A—0 to 7 inches; dark brown (10YR 4/3) gravelly loam, pale brown (10YR 6/3) dry; moderate very fine and fine subangular blocky structure; soft, friable, nonsticky and nonplastic; many fine and medium roots and common coarse roots; moderately acid; 15 percent gravel; abrupt smooth boundary.

Bw1—7 to 15 inches; yellowish brown (10YR 5/4) gravelly loam, light gray (10YR 7/2) dry; moderate very fine, fine, and medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common fine and medium roots and few coarse roots; 15 percent gravel and 5 percent cobbles; moderately acid; clear smooth boundary.

Bw2—15 to 21 inches; yellowish brown (10YR 5/4) very gravelly clay loam, light gray (10YR 7/2) dry; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; few fine and medium roots; 30 percent gravel and 5 percent cobbles; moderately acid; clear wavy boundary.

Bw3—21 to 30 inches; yellowish brown (10YR 5/4) very gravelly clay loam, light gray (10YR 7/2) dry; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; few fine and medium roots; 45 percent gravel and 10 percent cobbles; moderately acid; clear wavy boundary.

Bw4—30 to 37 inches; yellowish brown (10YR 5/4) very gravelly clay loam, light gray (10YR 7/2) dry; moderate very fine and fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and medium roots; 50 percent gravel and 10 percent cobbles; moderately acid; abrupt wavy boundary.

R—37 inches; serpentinitic rock.

Depth to bedrock is 20 to 40 inches.

The A horizon has hue of 10YR or 7.5YR, value of 2 to 4 moist and 4 to 6 dry, and chroma of 1 to 4 moist and 2 to 4 dry.

The Bw horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 3 to 5 moist and 5 to 7 dry, and chroma of 3 or 4 moist or dry. The horizon is very cobbly clay loam or very gravelly clay loam and is 35 to 60 percent rock fragments.

Greengulch Series

The Greengulch series consist of moderately deep, well drained soils on footslopes, side slopes, and ridges. These soils formed in residuum and colluvium derived from granodiorite. Slopes are 3 to 60 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of Greengulch silt loam in an area of Greengulch-Cedargrove complex, 30 to 60 percent south slopes; 3,250 feet north and 2,000 feet west of the southeast corner of sec. 4, T. 30 S., R. 4 W.

Oi—1.5 inches to 0; partially decomposed grasses, twigs, bark, and leaves.

A—0 to 3 inches; dark yellowish brown (10YR 3/4) silt loam, dark yellowish brown (10YR 4/4) dry; moderate fine, medium, and coarse granular structure and moderate very fine and fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and common fine, medium, and coarse roots; common very fine and fine irregular pores; slightly acid; clear smooth boundary.

AB—3 to 10 inches; dark brown (7.5YR 3/3) silty clay loam, yellowish brown (10YR 5/4) dry; moderate very fine and fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots and few fine, medium, and coarse roots; common very fine and few fine and medium irregular pores; moderately acid; gradual wavy boundary.

Bt1—10 to 14 inches; dark brown (7.5YR 4/4) clay, dark yellowish brown (10YR 4/4) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine, fine, medium, and coarse roots; common very fine and few fine irregular pores; common faint dark brown (7.5YR 3/2) clay films on faces of peds and in pores; moderately acid; gradual wavy boundary.

Bt2—14 to 20 inches; strong brown (7.5YR 4/6) clay, dark yellowish brown (10YR 4/4) dry; few fine prominent pinkish white (7.5YR 8/2) variegations; strong medium and coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots; common very fine and few fine irregular pores; common distinct dark brown (7.5YR 3/2) clay films on faces of peds and in pores; moderately acid; gradual wavy boundary.

Bt3—20 to 30 inches; dark brown (7.5YR 4/4) clay, dark yellowish brown (10YR 4/4) dry; few fine prominent pinkish white (7.5YR 8/2) variegations; strong medium and coarse subangular blocky structure; hard, very firm, sticky and plastic; few very fine roots; common very fine irregular pores; many distinct dark brown (7.5YR 3/2) clay films on faces of peds and in pores; moderately acid; gradual wavy boundary.

Crt—30 inches; strong brown (7.5YR 4/6) highly weathered granodiorite, dark yellowish brown (10YR 4/4) dry; common fine prominent pinkish white (7.5YR 8/2) variegations and few fine prominent light reddish brown (5YR 6/4) variegations; many faint dark brown (7.5YR 3/2) clay films along fractures.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A and AB horizons have value of 4 or 5 dry and chroma of 3 or 4 moist or dry. They are silt loam in the upper part and silty clay loam in the lower part.

The Bt horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 3 to 6 moist or dry. It is silty clay or clay.

Gustin Series

The Gustin series consists of very deep, somewhat poorly drained soils on footslopes and side slopes. These soils formed in residuum and colluvium derived from ashflow volcanic rock. Slopes are 3 to 45 percent. The mean annual precipitation is about 65 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Gustin clay loam in an area of Orford-Gustin complex, 30 to 60 percent slopes; 420 feet west and 1,735 feet north of the southeast corner of sec. 25, T. 27 S., R. 3 W.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) clay loam, dark brown (10YR 3/3) dry; moderate very fine, fine, and medium granular structure; hard, firm, sticky and slightly plastic; many very fine and common fine roots; many very fine and fine irregular pores; 5 percent soft tuff gravel; moderately acid; clear wavy boundary.

A2—3 to 7 inches; dark brown (10YR 3/3) clay loam, brown (10YR 4/3) dry; moderate fine and medium subangular blocky structure; hard, firm, very sticky and plastic; common very fine, fine, medium, and coarse roots; many very fine and fine irregular pores; very strongly acid; clear smooth boundary.

Bw—7 to 16 inches; brown (7.5YR 4/4) clay, dark yellowish brown (10YR 4/4) dry; organic coatings that are dark yellowish brown (10YR 3/4) when moist; moderate fine and medium subangular blocky structure; very hard, firm, very sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine and fine tubular pores; 5 percent soft tuff gravel; very strongly acid; gradual wavy boundary.

Btg1—16 to 24 inches; brown (7.5YR 4/4) clay, dark yellowish brown (10YR 4/4) dry; common fine prominent grayish brown (2.5Y 5/2) mottles; moderate medium and coarse subangular blocky structure; very hard, firm, very sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine tubular pores; common distinct clay films on faces of peds and in pores; 10 percent soft tuff gravel; extremely acid; clear smooth boundary.

Btg2—24 to 36 inches; mottled, yellowish red (5YR 5/8) and grayish brown (2.5Y 5/2) clay, strong brown (7.5YR 5/8) and light brownish gray (2.5Y 6/2) dry; moderate medium and coarse subangular blocky structure; very hard, firm, very sticky and plastic; common very fine roots; common very fine tubular pores; many prominent clay films on faces of peds and in pores; 15 percent soft tuff gravel; very strongly acid; abrupt smooth boundary.

Btg3—36 to 40 inches; mottled, yellowish red (5YR 5/8) and grayish brown (2.5Y 5/2) clay, strong brown (7.5YR 5/8) and light brownish gray (2.5Y 6/2) dry; moderate medium and coarse subangular blocky structure; hard, friable, very sticky and plastic; common very fine roots; common very fine tubular pores; common prominent clay films on faces of peds and in pores; 20 percent soft tuff gravel; extremely acid; abrupt smooth boundary.

Btg4—40 to 46 inches; mottled, yellowish red (5YR 5/8) and grayish brown (2.5Y 5/2) clay, strong brown (7.5YR 5/8) and light brownish gray (2.5Y 6/2) dry; moderate medium and coarse subangular blocky structure; very hard, very firm, very sticky and plastic; few very fine roots; common very fine tubular pores; common distinct clay films on faces of peds and in pores; 25 percent soft tuff gravel; extremely acid; clear wavy boundary.

Btg5—46 to 60 inches; grayish brown (2.5Y 5/2) clay, light brownish gray (2.5Y 6/2) dry; common fine prominent yellowish red (5YR 5/8) mottles; moderate medium and coarse subangular blocky structure; very hard, firm, very sticky and plastic; few very fine roots; common very fine tubular pores; common distinct clay films on faces of peds and in pores; 15 percent soft tuff gravel; extremely acid.

Depth to bedrock is 60 inches or more. Mottles that are a result of wetness are below a depth of 10 inches.

The A horizon has value of 3 or 4 moist and 3 to 5 dry, and it has chroma of 1 to 4 moist or dry.

The redoximorphic concentrations in the Btg horizon dominantly have hue of 5YR or 7.5Y and the redoximorphic depletions have hue of 2.5Y or 5Y. The horizon has value of 4 to 6 moist and 4 to 8 dry, and it has chroma of 1 to 4 moist or dry. It is clay or silty clay.

Haflinger Series

The Haflinger series consists of very deep, excessively drained soils on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 60 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Haflinger cobbly sandy loam in an area of Jimbo-Haflinger complex, 0 to 3 percent slopes; 2,200 feet south and 200 feet west of the northeast corner of sec. 16, T. 25 S., R. 2 W.

Oi—1.5 inches to 0; slightly decomposed needles, leaves, and twigs.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) cobbly sandy loam, dark grayish brown (10YR 4/2) dry; weak fine and medium granular structure; slightly hard, friable, nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; many very fine irregular pores; 15 percent cobbles; moderately acid; abrupt smooth boundary.

A2—3 to 5 inches; very dark grayish brown (10YR 3/2) cobbly sandy loam, brown (10YR 5/3) dry; weak very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; many very fine tubular pores; 15 percent cobbles; moderately acid; clear smooth boundary.

Bw—5 to 10 inches; dark brown (10YR 3/3) cobbly sandy loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; many very fine tubular pores; 10 percent gravel and 10 percent cobbles; strongly acid; clear smooth boundary.

C—10 to 60 inches; dark brown (10YR 3/3) extremely cobbly sand, yellowish brown (10YR 5/4) dry; single grain; loose, nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; common fine irregular pores; 35 percent gravel and 40 percent cobbles; strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 2 or 3 moist or dry.

The B horizon has hue of 10YR or 7.5YR.

The C horizon has value of 5 or 6 dry and chroma of 3 or 4 moist or dry. It is loamy sand or sand and is 50 to 80 percent rock fragments.

Harrington Series

The Harrington series consists of moderately deep, well drained soils on side slopes and ridges. These soils formed in colluvium derived from volcanic rock.

Slopes are 3 to 90 percent. The mean annual precipitation is about 65 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Harrington very gravelly loam in an area of Klickitat-Harrington complex, 60 to 90 percent south slopes; 1,300 feet north and 1,350 feet east of the southwest corner of sec. 9, T. 25 S., R. 2 W.

Oi—1 inch to 0; slightly decomposed needles, twigs, leaves, and mosses.

A—0 to 5 inches; dark reddish brown (5YR 3/2) very gravelly loam, reddish brown (5YR 4/3) dry; moderate fine and medium granular structure; slightly hard, friable, nonsticky and nonplastic; many very fine and fine roots and few coarse roots; many very fine irregular pores; 35 percent gravel; moderately acid; clear wavy boundary.

Bw1—5 to 12 inches; dark reddish brown (5YR 3/3) very gravelly clay loam, reddish brown (5YR 4/4) dry; moderate fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and few coarse roots; common very fine irregular pores; 50 percent gravel; strongly acid; clear wavy boundary.

Bw2—12 to 28 inches; dark reddish brown (5YR 3/4) very gravelly clay loam, yellowish red (5YR 4/6) dry; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine irregular pores; 40 percent gravel and 15 percent cobbles; strongly acid; clear wavy boundary.

BC—28 to 34 inches; reddish brown (5YR 4/4) extremely gravelly loam, yellowish red (5YR 5/6) dry; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common fine and medium irregular pores; 50 percent gravel and 20 percent cobbles; strongly acid; abrupt wavy boundary.

R—34 inches; basalt.

Depth to bedrock is 20 to 40 inches.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 2 or 3 moist and 3 or 4 dry. The horizon is 35 to 60 percent rock fragments.

The Bw and BC horizons have hue of 7.5YR, 5YR, or 2.5YR, value of 3 or 4 moist and 4 to 6 dry, and chroma of 2 to 6 moist or dry. The horizons are very gravelly clay loam, extremely gravelly loam, or very cobbly loam and are 35 to 80 percent rock fragments.

Harslow Series

The Harslow series consists of moderately deep, well drained soils on side slopes. These soils formed in colluvium derived from basalt. Slopes are 60 to 90 percent. The mean annual precipitation is about 85 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Harslow very gravelly loam in an area of Kilchis-Harslow-Rock outcrop complex, 60 to 100 percent south slopes; 650 feet west and 100 feet south of the northeast corner of sec. 23, T. 19 S., R. 10 W.

Oi—2 inches to 0; slightly decomposed needles and twigs.

A—0 to 10 inches; dark brown (7.5YR 3/2) very gravelly loam, brown (7.5YR 5/2) dry; moderate very fine granular structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots, common fine and medium roots, and few coarse roots; many very fine irregular pores; 35 percent gravel and 5 percent cobbles; very strongly acid; clear smooth boundary.

Bw—10 to 15 inches; dark brown (7.5YR 4/3) very gravelly loam, brown (7.5YR 5/4) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots and few coarse roots; many very fine tubular pores; 40 percent gravel and 5 percent cobbles; strongly acid; clear wavy boundary.

BC—15 to 25 inches; dark brown (7.5YR 4/4) extremely gravelly loam, light brown (7.5YR 6/4) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and few fine, medium, and coarse roots; many very fine tubular pores; 45 percent gravel and 20 percent cobbles; strongly acid; abrupt wavy boundary.

R—25 inches; basalt.

Depth to bedrock is 20 to 40 inches. The profile has hue of 7.5YR or 5YR. Moist bulk density is less than 1.00 gram per cubic centimeter.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry. It is 35 to 50 percent rock fragments.

The Bw horizon has value of 4 or 5 moist and 5 or 6 dry, and it has chroma of 3 or 4 moist and 4 to 6 dry. The horizon is very gravelly loam or very cobbly loam and is 40 to 60 percent rock fragments.

The BC horizon has value of 4 or 5 moist and

5 or 6 dry, and it has chroma of 3 or 4 moist and 4 to 6 dry. The horizon is extremely gravelly loam or extremely cobbly loam and is 60 to 80 percent rock fragments.

Heceta Series

The Heceta series consists of very deep, poorly drained soils in interdunal swales and depressions. These soils formed in eolian sand. Slopes are 0 to 2 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Heceta fine sand in an area of Heceta-Waldport complex, 0 to 12 percent slopes; 1,500 feet north and 125 feet west of the southeast corner of sec. 24, T. 21 S., R. 13 W.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) fine sand, brown (10YR 5/3) dry; common medium distinct strong brown (7.5YR 5/8) mottles concentrated along root channels; single grain; loose; many very fine and fine roots and common medium roots; slightly acid; clear smooth boundary.

C1—2 to 16 inches; dark grayish brown (10YR 4/2) fine sand, light brownish gray (10YR 6/2) dry; few fine faint strong brown (7.5YR 5/6) mottles concentrated along root channels; single grain; loose; few fine and medium roots; slightly acid; clear smooth boundary.

C2—16 to 60 inches; dark grayish brown (10YR 4/2) fine sand, light gray (10YR 7/2) dry; single grain; loose; few medium roots; neutral.

Depth to bedrock is 60 inches or more. Mottles that are a result of wetness are throughout the profile.

The A horizon has hue of 2.5Y or 10YR, value of 2 to 5 moist and 5 to 7 dry, and chroma of 1 to 3 moist or dry.

The C horizon has hue of 5Y, 2.5Y, or 10YR, value of 4 or 5 moist and 6 or 7 dry, and chroma of 1 to 3 moist or dry. The horizon is sand, fine sand, or loamy sand.

Hemcross Series

The Hemcross series consists of very deep, well drained soils on broad ridges and side slopes. These soils formed in residuum and colluvium derived from basalt. Slopes are 3 to 60 percent. The mean annual precipitation is about 90 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Hemcross silt loam in an area of Hemcross-Klistan complex, 3 to 30 percent slopes; 1,475 feet west and 990 feet south of the northeast corner of sec. 23, T. 19 S., R. 10 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A1—0 to 4 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/4) dry; strong very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots, common medium roots, and few coarse roots; many very fine and fine irregular pores; 10 percent gravel; strongly acid; clear smooth boundary.

A2—4 to 11 inches; dark reddish brown (5YR 3/3) silt loam, brown (7.5YR 5/4) dry; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and few medium and coarse roots; many very fine and fine irregular pores; 10 percent gravel; strongly acid; clear smooth boundary.

Bw1—11 to 29 inches; yellowish red (5YR 4/6) silt loam, strong brown (7.5YR 5/6) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and slightly plastic; common fine roots and few medium and coarse roots; many fine and medium tubular and irregular pores; 5 percent gravel; very strongly acid; clear smooth boundary.

Bw2—29 to 44 inches; strong brown (7.5YR 4/6) silt loam, reddish yellow (7.5YR 6/6) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and slightly plastic; few fine and medium roots; many very fine and fine irregular and tubular pores; 10 percent gravel; very strongly acid; clear smooth boundary.

Bw3—44 to 60 inches; strong brown (7.5YR 4/6) gravelly loam, reddish yellow (7.5YR 6/6) dry; weak medium and coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine and medium roots; common very fine, fine, and medium tubular and irregular pores; 30 percent gravel; very strongly acid.

Depth to bedrock is 60 inches or more. Moist bulk density is less than 1.00 gram per cubic centimeter. The profile has hue of 7.5YR or 5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist and 2 to 4 dry.

The Bw horizon has value of 3 or 4 moist and 5 or 6 dry, and it has chroma of 4 to 6 moist or dry. It is loam, silt loam, or gravelly loam.

Hilltish Series

The Hilltish series consists of moderately deep, well drained soils on side slopes. These soils formed in colluvium and residuum derived from conglomerate. Slopes are 30 to 90 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Hilltish very gravelly sandy loam, 60 to 90 percent south slopes; 1,500 feet south and 1,750 feet west of the northeast corner of sec. 3, T. 30 S., R. 5 W.

A—0 to 2 inches; dark brown (10YR 3/3) very gravelly sandy loam, brown (10YR 4/3) dry; moderate fine and medium granular structure; soft, friable, nonsticky and nonplastic; many fine roots; many medium irregular pores; 30 percent gravel and 5 percent cobbles; slightly acid; abrupt smooth boundary.

AB—2 to 4 inches; dark brown (10YR 3/3) very gravelly sandy loam, brown (10YR 5/3) dry; weak fine and medium granular structure; soft, friable, nonsticky and nonplastic; many fine and medium roots; many medium irregular pores; 40 percent gravel and 5 percent cobbles; moderately acid; clear smooth boundary.

Bw1—4 to 9 inches; brown (10YR 4/3) very gravelly sandy loam, brown (10YR 5/3) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many fine and medium roots; common medium vesicular and tubular pores; 35 percent gravel and 5 percent cobbles; moderately acid; clear smooth boundary.

Bw2—9 to 14 inches; brown (7.5YR 5/3) very gravelly sandy loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many medium and few coarse roots; common fine vesicular and tubular pores; 30 percent gravel and 5 percent cobbles; moderately acid; clear smooth boundary.

BC—14 to 18 inches; brown (7.5YR 5/3) extremely cobbly sandy loam, light brown (7.5YR 6/3) dry; weak fine and medium subangular blocky structure; hard, friable, nonsticky and nonplastic; many fine and common medium roots; many medium vesicular and tubular pores; 35 percent gravel and 30 percent cobbles; moderately acid (pH 5.8); gradual wavy boundary.

C—18 to 27 inches; reddish yellow (7.5YR 6/6) extremely cobbly sandy loam, pink (7.5YR 7/4) dry; massive; hard, friable, nonsticky and nonplastic; few medium roots; few medium irregular pores; 40 percent gravel and 30 percent cobbles; moderately acid (pH 5.6); clear smooth boundary.

R—27 inches; conglomerate.

Depth to bedrock is 20 to 40 inches.

The A and AB horizons have value of 3 to 5 moist and 4 to 6 dry, and they have chroma of 2 to 4 moist or dry. They are 35 to 60 percent rock fragments.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 to 6 moist and 5 to 7 dry, and chroma of 3 to 6 moist or dry. The horizon is very gravelly sandy loam, extremely gravelly sandy loam, or very gravelly coarse sandy loam and is 35 to 70 percent rock fragments.

The BC and C horizons have hue of 10YR or 7.5YR, value of 4 to 6 moist and 5 to 7 dry, and chroma of 3 to 6 moist or dry. The horizons are very gravelly sandy loam, very gravelly sandy clay loam, or extremely cobbly sandy loam and are 35 to 75 percent rock fragments.

Honeygrove Series

The Honeygrove series consists of very deep, well drained soils on footslopes, side slopes, and broad ridges. These soils formed in residuum and colluvium derived from sandstone, siltstone, and volcanic rock. Slopes are 3 to 60 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Honeygrove gravelly clay loam, 3 to 30 percent slopes; 850 feet west and 200 feet south of the northeast corner of sec. 23, T. 21 S., R. 6 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A1—0 to 5 inches; dark reddish brown (5YR 3/2) gravelly clay loam, reddish brown (5YR 4/3) dry; moderate fine and medium granular structure; slightly hard, firm, slightly sticky and slightly plastic; many very fine, fine, and medium roots and few coarse roots; many fine irregular pores; 25 percent rounded fine gravel; moderately acid; clear smooth boundary.

A2—5 to 12 inches; dark reddish brown (5YR 3/3) gravelly clay loam, reddish brown (5YR 4/4) dry; moderate medium and coarse granular structure; slightly hard, firm, slightly sticky and slightly plastic; many very fine, fine, and medium roots and few coarse roots; many very fine and fine irregular and tubular pores; 15 percent rounded fine gravel; moderately acid; clear smooth boundary.

BAt—12 to 20 inches; dark reddish brown (5YR 3/3) clay, reddish brown (5YR 4/4) dry; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; common fine and medium roots; common very fine and fine tubular pores; common faint clay films on faces of peds and in pores; 10 percent rounded gravel; strongly acid; gradual smooth boundary.

Bt1—20 to 30 inches; dark reddish brown (2.5YR 3/4) clay, reddish brown (2.5YR 4/4) dry; moderate medium and coarse subangular blocky structure; hard, firm, very sticky and very plastic; few fine and medium roots; few very fine and fine tubular pores; many distinct clay films on faces of peds and in pores; strongly acid; gradual smooth boundary.

Bt2—30 to 48 inches; dark red (2.5YR 3/6) clay, red (2.5YR 4/6) dry; moderate medium and coarse subangular blocky structure parting to fine and medium subangular blocky; hard, firm, sticky and plastic; few fine and medium roots; few very fine and fine tubular pores; many prominent clay films on faces of peds and in pores; strongly acid; gradual smooth boundary.

Bt3—48 to 58 inches; dark red (2.5YR 3/6) clay, red (2.5YR 4/6) dry; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; few medium roots; few very fine tubular pores; common prominent clay films on faces of peds and in pores; 5 percent soft siltstone gravel; strongly acid; gradual smooth boundary.

BCt—58 to 63 inches; dark red (2.5YR 3/6) clay, red (2.5YR 4/6) dry; weak fine and medium subangular blocky structure; slightly hard, firm, sticky and plastic; few very fine tubular pores; common prominent clay films on faces of peds and in pores; 10 percent soft siltstone gravel; strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 5YR or 7.5YR, value of 2 or 3 moist and 3 or 4 dry, and chroma of 2 to 4 moist or dry.

The Bt horizon has hue of 2.5YR or 5YR, value of 3 or 4 moist and 4 or 5 dry, and chroma of 4 to 6 moist or dry. The horizon is silty clay, clay, or gravelly clay.

Hummington Series

The Hummington series consists of moderately deep, well drained soils on side slopes. These soils formed in colluvium derived from volcanic rock. Slopes are 30 to 90 percent. The mean annual precipitation is about 70 inches, and the mean annual air temperature is about 42 degrees F.

Typical pedon of Hummington very gravelly loam, 60 to 90 percent north slopes; 1,700 feet north and 1,700 feet east of the southwest corner of sec. 6, T. 24 S., R. 1 W.

Oi—2 inches to 0; slightly decomposed needles, roots, and twigs.

A—0 to 6 inches; very dark brown (10YR 2/2) very gravelly loam, very dark grayish brown (10YR 3/2) dry; strong very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots and common fine, medium, and coarse roots; many very fine irregular pores; 45 percent gravel and 15 percent cobbles; very strongly acid; clear smooth boundary.

AB—6 to 16 inches; very dark brown (10YR 2/2) very gravelly loam, dark brown (10YR 3/3) dry; strong very fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine roots and few fine, medium, and coarse roots; many very fine tubular pores; 25 percent gravel and 10 percent cobbles; strongly acid; gradual wavy boundary.

Bw—16 to 22 inches; very dark grayish brown (10YR 3/2) extremely cobbly loam, brown (10YR 4/3) dry; strong very fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few very fine, fine, medium, and coarse roots; common very fine tubular pores; 25 percent gravel and 40 percent cobbles; strongly acid; abrupt wavy boundary.

R—22 inches; basalt.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5Y. Moist bulk density is less than 1.00 gram per cubic centimeter.

The A horizon has value of 2 or 3 moist and 3 or 4 dry, and it has chroma of 2 or 3 moist or dry. It is 35 to 60 percent rock fragments.

The Bw horizon has value of 3 or 4 moist and 4 or 5 dry, and it has chroma of 2 to 4 moist or dry. It is very gravelly loam, very cobbly loam, or extremely cobbly loam and is 35 to 70 percent rock fragments.

Illahee Series

The Illahee series consists of very deep, well drained soils on side slopes and ridges. These soils formed in colluvium and residuum derived from volcanic rock. Slopes are 3 to 90 percent. The mean annual precipitation is about 70 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of Illahee very gravelly loam in an area of Lempira-Illahee complex, 30 to 60 percent north slopes; 1,155 feet east and 945 feet south of the northwest corner of sec. 35, T. 25 S., R. 2 W.

Oi—1.5 inches to 0; slightly decomposed needles, twigs, and fern fronds.

A1—0 to 10 inches; black (10YR 2/1) very gravelly loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; slightly hard, friable, nonsticky and nonplastic; many very fine, fine, and medium roots and common coarse roots; common very fine irregular pores; 35 percent gravel; strongly acid; clear wavy boundary.

A2—10 to 15 inches; very dark brown (10YR 2/2) very gravelly loam, brown (10YR 5/3) dry; moderate fine and medium granular structure; slightly hard, friable, nonsticky and nonplastic; many very fine, fine, and medium roots and common coarse roots; common very fine irregular pores; 40 percent gravel; very strongly acid; clear wavy boundary.

Bw1—15 to 38 inches; very dark grayish brown (10YR 3/2) very gravelly loam, pale brown (10YR 6/3) dry; weak very fine and fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; common very fine irregular pores; 45 percent gravel and 5 percent cobbles; strongly acid; clear wavy boundary.

Bw2—38 to 47 inches; dark brown (10YR 3/3) very gravelly loam, light yellowish brown (10YR 6/4) dry; weak very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine, fine, and medium roots; common fine irregular pores; 40 percent gravel and 10 percent cobbles; strongly acid; clear wavy boundary.

BC—47 to 60 inches; dark yellowish brown (10YR 3/4) very cobbly loam, very pale brown (10YR 7/4) dry; weak very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common fine irregular pores; 30 percent gravel and 25 percent cobbles; very strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 1 or 2 moist and 2 or 3 dry. It is 35 to 60 percent rock fragments.

The B horizon has value of 3 or 4 moist and 5 to 7 dry, and it has chroma of 2 to 6 moist and 3 or 4 dry. It is very gravelly loam, very cobbly loam, or extremely gravelly loam and is 35 to 70 percent rock fragments.

Jayar Series

The Jayar series consists of moderately deep, well drained soils on side slopes and ridges. These soils formed in colluvium derived from metamorphic rock. Slopes are 12 to 70 percent. The mean annual precipitation is about 55 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of Jayar very gravelly loam, 30 to 70 percent north slopes; 100 feet north and 2,500 feet west of the southeast corner of sec. 24, T. 32 S., R. 4 W.

Oi—1 inch to 0; slightly decomposed needles, twigs, and roots.

A—0 to 3 inches; very dark brown (10YR 2/2) very gravelly loam, brown (10YR 5/3) dry; strong very fine and fine granular structure; loose, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots and few coarse roots; many very fine irregular pores; 50 percent gravel and 5 percent cobbles; moderately acid; abrupt smooth boundary.

Bw1—3 to 15 inches; dark brown (10YR 4/3) very gravelly loam, pale brown (10YR 6/3) dry; strong very fine and fine subangular blocky structure; loose, very friable, nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; many very fine tubular pores; 50 percent gravel and 5 percent cobbles; moderately acid; clear smooth boundary.

Bw2—15 to 26 inches; dark yellowish brown (10YR 4/4) very gravelly loam, light yellowish brown (10YR 6/4) dry; slightly hard, friable, slightly sticky and slightly plastic; common medium and coarse roots; common very fine tubular pores; 45 percent gravel and 15 percent cobbles; moderately acid; abrupt wavy boundary.

R—26 inches; metagabbro.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 to 4 moist and 5 or 6 dry, and it has chroma of 2 to 4 moist or dry. It is 35 to 60 percent rock fragments.

The B horizon has value of 3 to 5 moist and 5 to 7 dry, and it has chroma of 3 to 6 moist or dry. It is very gravelly loam, very gravelly clay loam, or very cobbly loam and is 35 to 60 percent rock fragments.

Jimbo Series

The Jimbo series consists of very deep, well drained soils on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 60 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Jimbo fine sandy loam in an area of Jimbo-Haflinger complex, 0 to 3 percent slopes; 1,800 feet east and 1,200 feet south of the northwest corner of sec. 15, T. 25 S., R. 2 W.

A1—0 to 10 inches; very dark brown (10YR 2/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine irregular pores; 10 percent gravel; moderately acid; clear smooth boundary.

A2—10 to 18 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots and few medium roots; common very fine tubular pores; 10 percent gravel; strongly acid; clear wavy boundary.

Bw—18 to 35 inches; brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; common very fine tubular pores; 5 percent gravel; strongly acid; abrupt wavy boundary.

2C—35 to 60 inches; brown (10YR 5/3) gravelly sand, light yellowish brown (10YR 6/4) dry; single grain; loose, nonsticky and nonplastic; few very fine roots; common very fine and fine irregular pores; 10 percent gravel and 5 percent cobbles; strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 2 or 3 moist or dry.

The B horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist and 5 or 6 dry, and chroma of 3 or 4 moist or dry.

The 2C horizon has value of 5 or 6 dry and chroma of 3 or 4 moist or dry. It is very cobbly sand or gravelly sand and is 15 to 70 percent rock fragments.

Jory Series

The Jory series consists of very deep, well drained soils on toeslopes, footslopes, side slopes, and ridges. These soils formed in residuum and colluvium derived from basalt. Slopes are 2 to 90 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Jory silty clay loam, 30 to 60 percent slopes; 1,900 feet north and 1,900 feet west of the southeast corner of sec. 34, T. 23 S., R. 5 W.

A1—0 to 8 inches; dark reddish brown (5YR 3/3) silty clay loam, reddish brown (5YR 4/4) dry; moderate fine and medium subangular blocky and granular structure; hard, firm, sticky and plastic; many very fine and fine roots and few medium roots; many very fine and fine tubular and irregular pores; moderately acid; clear smooth boundary.

A2—8 to 16 inches; dark reddish brown (5YR 3/4) silty clay loam, reddish brown (5YR 4/4) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots; many very fine, common fine, and few medium tubular pores; few faint organic coatings on faces of peds and in pores; moderately acid; clear smooth boundary.

BAt—16 to 24 inches; dark reddish brown (2.5YR 3/4) silty clay, dark red (2.5YR 3/6) dry; moderate medium and coarse subangular blocky structure; hard, firm, very sticky and plastic; common very fine and fine roots; many very fine and few medium tubular pores; common faint clay films in pores; few faint organic coatings on faces of peds and in pores; strongly acid; clear smooth boundary.

Bt1—24 to 33 inches; dark red (2.5YR 3/6) silty clay, red (2.5YR 4/6) dry; moderate medium and coarse subangular blocky structure; hard, very firm, very sticky and very plastic; few very fine roots; many very fine and fine tubular pores; common faint clay films on faces of peds and in pores; strongly acid; clear smooth boundary.

Bt2—33 to 48 inches; dark red (2.5YR 3/6) silty clay, red (2.5YR 4/6) dry; moderate medium and coarse subangular blocky structure; hard, very firm, very sticky and very plastic; few very fine roots; common very fine and fine tubular pores; many faint and distinct clay films on faces of peds and in pores; strongly acid; clear smooth boundary.

BCt—48 to 60 inches; dark red (2.5YR 3/6) silty clay, red (2.5YR 4/6) dry; moderate medium and coarse subangular blocky structure; hard, firm, very sticky and plastic; common very fine and fine tubular pores; many distinct and prominent clay films on faces of peds and in pores; 10 percent soft basalt gravel; strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 7.5YR or 5YR, value of 2 or 3 moist and 3 to 5 dry, and chroma of 2 to 4 moist and 3 to 6 dry.

The Bt horizon has hue of 5YR or 2.5YR and chroma of 4 to 6 moist or dry. It is clay or silty clay.

Josephine Series

The Josephine series consists of deep, well drained soils on toeslopes, footslopes, side slopes, and ridges. These soils formed in colluvium and residuum derived from sandstone, siltstone, and metamorphic rock. Slopes are 3 to 60 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Josephine gravelly loam in an area of Josephine-Speaker complex, 30 to 60 percent south slopes; about 1,990 feet north and 400 feet west of the southeast corner of sec. 34, T. 28 S., R. 6 W.

A—0 to 5 inches; dark brown (7.5YR 3/4) gravelly loam, brown (7.5YR 5/4) dry; moderate fine and medium granular structure and very fine and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; many very fine, fine, medium, and coarse roots; many very fine and fine discontinuous irregular and tubular pores; 20 percent gravel; moderately acid; abrupt wavy boundary.

Bw—5 to 22 inches; yellowish red (5YR 4/6) gravelly loam, yellowish red (5YR 5/6) dry; moderate very fine and fine subangular blocky structure; hard, friable, sticky and slightly plastic; many very fine and fine roots and common medium and coarse roots; many very fine and fine discontinuous and continuous tubular pores; 30 percent gravel; strongly acid; clear wavy boundary.

Bt1—22 to 38 inches; yellowish red (5YR 4/6) gravelly clay loam, reddish yellow (5YR 6/6) dry; moderate fine subangular blocky structure; hard, firm, sticky and slightly plastic; common very fine and fine roots; common fine and medium discontinuous irregular and tubular pores; few faint clay films on faces of peds and in pores; 30 percent gravel; strongly acid; abrupt wavy boundary.

Bt2—38 to 56 inches; yellowish red (5YR 4/6) gravelly clay loam, reddish yellow (5YR 6/6) dry; moderate fine and medium subangular blocky structure; very hard, firm, sticky and slightly plastic; common very fine and fine roots; many fine and medium discontinuous irregular and tubular pores; common distinct dark red (2.5YR 3/6) clay films on faces of peds and in pores; 25 percent gravel; strongly acid; clear wavy boundary.

BCt—56 to 59 inches; yellowish red (5YR 4/6) gravelly clay loam, yellowish red (5YR 5/6) dry; moderate fine and medium subangular blocky structure; very hard, firm, sticky and slightly plastic; common very fine and fine roots; many fine and medium discontinuous irregular and tubular pores; few faint dark red (2.5YR 3/6) clay films on faces of peds and in pores; 34 percent gravel; strongly acid; clear wavy boundary.

Cr—59 inches; weathered metasedimentary rock.

Depth to bedrock is 40 to 60 inches.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 2 to 4 moist and 5 or 6 dry, and chroma of 2 to 4 moist or dry.

The Bt horizon has hue of 7.5YR or 5YR, value of 4 or 5 moist and 5 to 8 dry, and chroma of 4 to 6 moist or dry. The horizon is clay loam or gravelly clay loam.

Kanid Series

The Kanid series consists of deep, well drained soils on footslopes, side slopes, and ridges. These soils formed in colluvium derived from sandstone and metamorphic rock. Slopes are 12 to 90 percent. The mean annual precipitation is about 50 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Kanid very gravelly loam in an area of Kanid-Atring complex, 60 to 90 percent south slopes; 2,000 feet north and 1,300 feet west of the southeast corner of sec. 11, T. 31 S., R. 8 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 6 inches; very dark grayish brown (10YR 3/2) very gravelly loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine irregular pores; 45 percent gravel and 10 percent cobbles; slightly acid; clear irregular boundary.

BA—6 to 19 inches; brown (10YR 4/3) extremely gravelly loam, light gray (10YR 7/2) dry; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots and few fine and medium roots; many very fine and fine irregular pores and many fine tubular pores; 70 percent fine gravel; neutral; gradual wavy boundary.

Bw1—19 to 37 inches; dark yellowish brown (10YR 4/4) very gravelly clay loam, light yellowish brown (10YR 6/4) dry; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and few medium roots; many very fine, fine, and medium irregular pores and many very fine tubular pores; 45 percent gravel; neutral; gradual irregular boundary.

Bw2—37 to 48 inches; dark brown (7.5YR 4/4) very gravelly clay loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine irregular pores; 40 percent gravel and 20 percent cobbles; moderately acid; clear wavy boundary.

Cr—48 inches; weathered sandstone.

Depth to bedrock is 40 to 60 inches.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist and 5 or 6 dry, and chroma of 2 to 4 moist or dry. The horizon is 35 to 60 percent rock fragments.

The Bw horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 3 to 5 moist and 5 to 7 dry, and chroma of 3 to 6 moist or dry. The horizon is extremely gravelly loam, very gravelly loam, or very gravelly clay loam and is 45 to 75 percent rock fragments.

Keel Series

The Keel series consists of moderately deep, well drained soils on broad ridges. These soils formed in residuum and colluvium derived from volcanic rock. Slopes are 3 to 30 percent. The mean annual precipitation is about 70 inches, and the mean annual air temperature is about 42 degrees F.

Typical pedon of Keel gravelly silt loam in an area of Oneonta-Keel complex, 3 to 30 percent slopes; 2,100 feet north and 900 feet east of the southwest corner of sec. 35, T. 23 S., R. 2 W.

Oi—2 inches to 0; slightly decomposed needles, twigs, and roots.

A—0 to 6 inches; very dark brown (10YR 2/2) gravelly silt loam, very dark grayish brown (10YR 3/2) dry; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots and common fine, medium, and coarse roots; many very fine irregular pores; 15 percent gravel; very strongly acid; abrupt smooth boundary.

Bw1—6 to 17 inches; dark brown (7.5YR 3/2) gravelly loam, brown (10YR 4/3) dry; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine roots and few fine, medium, and coarse roots; many very fine irregular and tubular pores; 15 percent gravel and 5 percent cobbles; very strongly acid; clear wavy boundary.

Bw2—17 to 22 inches; dark brown (7.5YR 3/2) cobbly loam, dark yellowish brown (10YR 4/4) dry; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few very fine, fine, medium, and coarse roots; common very fine tubular pores; 15 percent gravel and 15 percent cobbles; very strongly acid; abrupt wavy boundary.

R—22 inches; basalt.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR. Moist bulk density is less than 1.00 gram per cubic centimeter.

The A horizon has value of 2 or 3 moist and 3 to 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bw horizon has value of 3 to 5 moist and 4 to 6 dry, and it has chroma of 2 to 4 moist or dry. It is gravelly loam, cobbly loam, or clay loam.

Kilchis Series

The Kilchis series consists of shallow, well drained soils on side slopes and headwalls. These soils formed in colluvium derived from volcanic rock. Slopes are 60 to 100 percent. The mean annual precipitation is about 85 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Kilchis very cobbly loam in an area of Kilchis-Harslow-Rock outcrop complex, 60 to 100 percent south slopes; 650 feet west and 100 feet south of the northeast corner of sec. 23, T. 19 S., R. 10 W.

Oi—0.5 inch to 0; slightly decomposed needles, leaves, and twigs.

A1—0 to 4 inches; dark brown (7.5YR 3/2) very cobbly loam, brown (7.5YR 4/4) dry; strong very fine and fine granular structure; slightly hard, friable, nonsticky and nonplastic; many fine and medium roots and few coarse roots; many very fine and fine irregular pores; 20 percent gravel and 25 percent cobbles; strongly acid; clear smooth boundary.

A2—4 to 10 inches; dark brown (7.5YR 3/3) very cobbly loam, brown (7.5YR 4/4) dry; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots and few coarse roots; common very fine and fine irregular pores; 35 percent gravel and 20 percent cobbles; strongly acid; clear smooth boundary.

Bw—10 to 18 inches; brown (7.5YR 4/4) very cobbly loam, light brown (7.5YR 6/4) dry; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and medium roots; many very fine and fine irregular pores; 20 percent gravel and 35 percent cobbles; strongly acid; abrupt smooth boundary.

R—18 inches; basalt.

Depth to bedrock is 10 to 20 inches. The profile has hue of 7.5YR or 5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist and 2 to 4 dry. It is 35 to 60 percent rock fragments.

The Bw horizon has value of 2 to 4 moist and 3 to 6 dry, and it has chroma of 2 to 4 moist or dry. It is very cobbly loam, very stony loam, or extremely gravelly silt loam and is 35 to 80 percent rock fragments.

Kinney Series

The Kinney series consists of very deep, well drained soils on side slopes and ridges. These soils formed in colluvium and residuum derived from volcanic rock. Slopes are 3 to 60 percent. The mean annual precipitation is about 65 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Kinney gravelly loam in an area of Klickitat-Kinney complex, 30 to 60 percent slopes; 50 feet east and 1,940 feet north of the southwest corner of sec. 36, T. 25 S., R. 2 W.

Oi—1.5 inches to 0; slightly decomposed needles, twigs, and leaves.

A—0 to 5 inches; very dark grayish brown (10YR 3/2) gravelly loam, brown (10YR 5/3) dry; moderate very fine and fine granular structure; friable, slightly hard, nonsticky and nonplastic; many very fine roots and common fine, medium, and coarse roots; many very fine irregular pores; 30 percent gravel 2 to 45 millimeters in diameter; moderately acid; clear smooth boundary.

Bw1—5 to 14 inches; dark brown (10YR 3/3) gravelly loam, brown (10YR 5/3) dry; moderate very fine and fine subangular blocky structure; friable, slightly hard, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; many very fine irregular pores; 15 percent gravel 2 to 45 millimeters in diameter; strongly acid; clear wavy boundary.

Bw2—14 to 32 inches; dark brown (10YR 4/3) clay loam, yellowish brown (10YR 5/4) dry; moderate very fine and fine subangular blocky structure; firm, hard, sticky and plastic; common very fine, fine, medium, and coarse roots; many very fine irregular pores; 10 percent gravel 2 to 45 millimeters in diameter; strongly acid; clear wavy boundary.

Bw3—32 to 44 inches; dark brown (10YR 4/3) clay loam, light yellowish brown (10YR 6/4) dry; moderate very fine and fine subangular blocky structure; firm, hard, sticky and plastic; common very fine and fine roots and few coarse roots; many fine irregular pores; 14 percent gravel 2 to 45 millimeters in diameter; very strongly acid; clear wavy boundary.

Bw4—44 to 60 inches; dark yellowish brown (10YR 4/4) gravelly clay loam, light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; firm, hard, sticky and plastic; common very fine and fine roots and few coarse roots; common fine and medium irregular pores; 20 percent gravel 2 to 45 millimeters in diameter; very strongly acid.

Depth to bedrock is 40 to 60 inches.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 moist and 3 to 5 dry, and chroma of 2 to 4 moist or dry.

The Bw horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 to 5 moist and 4 to 6 dry, and chroma of 3 to 6 moist or dry. The horizon is loam, gravelly loam, gravelly clay loam, or clay loam.

Kirkendall Series

The Kirkendall series consists of very deep, well drained soils on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Kirkendall silt loam in an area of Kirkendall-Nekoma complex, 0 to 3 percent slopes; 770 feet west and 700 feet south of the northeast corner of sec. 31, T. 20 S., R. 9 W.

Oi—2 inches to 0; slightly decomposed needles, leaves, twigs, and mosses.

A1—0 to 4 inches; very dark brown (10YR 2/2) silt loam, dark brown (10YR 4/3) dry; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many very fine and fine tubular and irregular pores; strongly acid; clear smooth boundary.

A2—4 to 10 inches; very dark brown (10YR 2/2) silt loam, dark brown (10YR 4/3) dry; moderate fine and medium subangular blocky structure parting to fine and medium granular; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many very fine and fine tubular and irregular pores; strongly acid; clear smooth boundary.

AB—10 to 19 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many very fine roots and common fine and medium roots; many very fine and common fine tubular pores; very strongly acid; clear smooth boundary.

Bw1—19 to 26 inches; dark yellowish brown (10YR 3/4) silty clay loam, yellowish brown (10YR 5/4) dry; weak medium and coarse subangular blocky structure; soft, friable, sticky and plastic; common very fine and few fine roots; common very fine and fine tubular pores; very strongly acid; clear smooth boundary.

Bw2—26 to 37 inches; dark yellowish brown (10YR 3/4) silty clay loam, light yellowish brown (10YR 6/4) dry; weak medium and coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine and fine roots; few very fine and fine tubular pores; few faint coatings of silt in pores; very strongly acid; clear smooth boundary.

C1—37 to 42 inches; dark yellowish brown (10YR 4/4) silty clay loam, light yellowish brown (10YR 6/4) dry; common fine and medium faint brown (10YR 5/3) and strong brown (7.5YR 4/6) mottles; massive; soft, friable, sticky and plastic; few very fine roots; few very fine and fine tubular pores; very strongly acid; clear smooth boundary.

C2—42 to 54 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish (10YR 6/4) dry; common fine and medium faint brown (10YR 5/3) and strong brown (7.5YR 4/6) mottles; massive; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; very strongly acid; clear smooth boundary.

C3—54 to 63 inches; dark yellowish brown (10YR 4/4) silt loam, yellowish brown (10YR 5/4) dry; common fine and medium faint brown (10YR 5/3) and strong brown (7.5YR 4/6) mottles; massive; soft, friable, nonsticky and nonplastic; few very fine irregular pores; very strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bw horizon has value of 3 or 4 moist and 5 or 6 dry, and it has chroma of 3 or 4 moist or dry. It is silt loam or silty clay loam.

The C horizon has value of 3 to 5 moist and 5 or 6 dry, and it has chroma of 3 or 4 moist or dry. It is silty clay loam, silt loam, or loam. Lenses of loamy very fine sand and very fine sandy loam are in some pedons.

Klickitat Series

The Klickitat series consists of very deep, well drained soils on side slopes and ridges. These soils formed in colluvium and residuum derived from volcanic rock. Slopes are 3 to 90 percent. The mean annual precipitation is about 65 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Klickitat extremely gravelly loam in an area of Klickitat-Harrington complex, 60 to 90 percent north slopes; 4,200 feet north and 3,045 feet east of the southwest corner of sec. 1, T. 25 S., R. 2 W.

Oi—1.5 inches to 0; slightly decomposed twigs, needles, and fern fronds.

A—0 to 11 inches; dark reddish brown (5YR 3/3) extremely gravelly loam, brown (7.5YR 5/4) dry; moderate fine and medium granular structure; slightly hard, firm, slightly sticky and slightly plastic; many very fine roots and common fine, medium, and coarse roots; many fine irregular pores; 50 percent gravel and 15 percent cobbles; moderately acid; clear smooth boundary.

Bw1—11 to 22 inches; dark brown (7.5YR 3/4) very gravelly loam, brown (7.5YR 5/4) dry; moderate very fine, fine, and medium subangular blocky structure; hard, firm, sticky and slightly plastic; many very fine roots and common fine, medium, and coarse roots; common very fine irregular pores; 30 percent gravel and 10 percent cobbles; strongly acid; clear wavy boundary.

Bw2—22 to 38 inches; strong brown (7.5YR 4/6) very gravelly loam, reddish yellow (7.5YR 6/6) dry; weak fine and medium subangular blocky structure; hard, firm, sticky and slightly plastic; common very fine, fine, medium, and coarse roots; common very fine irregular pores; 35 percent gravel and 10 percent cobbles; strongly acid; clear wavy boundary.

Bw3—38 to 51 inches; yellowish red (5YR 4/6) very gravelly loam, strong brown (7.5YR 5/6) dry; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots and few medium and coarse roots; common very fine irregular pores; 40 percent gravel and 15 percent cobbles; strongly acid; clear wavy boundary.

Bw4—51 to 60 inches; strong brown (7.5YR 4/6) very gravelly loam, reddish yellow (7.5YR 6/6) dry; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; common very fine irregular pores;

35 percent gravel and 15 percent cobbles; very strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR, 7.5YR, or 5YR.

The A horizon has value of 2 or 3 moist and 3 to 5 dry, and it has chroma of 2 or 3 moist and 2 to 4 dry. It is 60 to 75 percent rock fragments.

The Bw horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 3 to 6 moist and 4 to 6 dry. It is very gravelly loam or very cobbly loam and is 35 to 60 percent rock fragments.

Klistan Series

The Klistan series consists of very deep, well drained soils on broad ridges and side slopes. These soils formed in colluvium and residuum derived from basalt. Slopes are 3 to 60 percent. The mean annual precipitation is about 90 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Klistan gravelly loam in an area of Hemcross-Klistan complex, 3 to 30 percent slopes; 1,975 feet west and 990 feet south of the northeast corner of sec. 23, T. 19 S., R. 10 W.

Oi—1.5 inches to 0; slightly decomposed needles, twigs, and leaves.

A1—0 to 7 inches; dark brown (7.5YR 3/2) gravelly loam, dark brown (7.5YR 4/3) dry; strong fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many fine and medium roots and few coarse roots; many very fine and fine irregular pores; 20 percent gravel and 10 percent cobbles; strongly acid; clear smooth boundary.

A2—7 to 17 inches; dark brown (7.5YR 3/2) very gravelly loam, brown (7.5YR 5/3) dry; moderate medium and coarse granular structure; soft, friable, nonsticky and nonplastic; common fine and medium roots and few coarse roots; many very fine and fine irregular pores; 25 percent gravel and 10 percent cobbles; strongly acid; clear smooth boundary.

Bw1—17 to 25 inches; dark brown (7.5YR 3/4) very gravelly loam, light brown (7.5YR 6/4) dry; weak medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; common fine roots and few medium and coarse roots; common very fine and fine tubular and irregular pores; 40 percent gravel and 10 percent cobbles; strongly acid; clear smooth boundary.

Bw2—25 to 60 inches; brown (7.5YR 4/4) very gravelly loam, light brown (7.5YR 6/4) dry; weak medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky and nonplastic; few fine roots; common very fine and fine irregular pores; 40 percent gravel and 15 percent cobbles; strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 7.5YR or 5YR. Moist bulk density is less than 1.00 gram per cubic centimeter.

The A horizon has value of 2 or 3 moist and 3 to 5 dry, and it has chroma of 2 or 3 moist or dry. The horizon is gravelly loam in the upper part and gravelly loam or very gravelly loam in the lower part. It is 20 to 60 percent rock fragments.

The Bw horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 3 or 4 moist or dry. It is very gravelly loam or extremely gravelly loam and is 40 to 70 percent rock fragments.

Laderly Series

The Laderly series consists of moderately deep, well drained soils on side slopes. These soils formed in colluvium derived from basalt. Slopes are 30 to 90 percent. The mean annual precipitation is about 105 inches, and the mean annual air temperature is about 44 degrees F.

Typical pedon of Laderly very gravelly loam, 30 to 60 percent north slopes; 2,075 feet east and 250 feet south of the northwest corner of sec. 23, T. 19 S., R. 9 W.

Oi—3 inches to 0; slightly decomposed needles, leaves, and twigs.

A1—0 to 4 inches; very dark brown (10YR 2/2) very gravelly loam, dark brown (10YR 3/3) dry; strong very fine and fine granular structure; soft, very friable, slightly sticky and nonplastic; many very fine, fine, and medium roots and common coarse roots; many very fine irregular pores; 40 percent gravel and 5 percent cobbles; very strongly acid; clear smooth boundary.

A2—4 to 13 inches; dark brown (7.5YR 3/2) very gravelly loam, dark brown (10YR 4/3) dry; moderate very fine and fine granular structure; soft, very friable, slightly sticky and nonplastic; weakly smeary; many very fine, fine, and medium roots and common coarse roots; many fine irregular pores; 45 percent gravel and 10 percent cobbles; very strongly acid; clear wavy boundary.

Bw—13 to 21 inches; dark yellowish brown (10YR 3/4) extremely cobbly loam, yellowish brown (10YR 5/6) dry; weak fine and medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; moderately smeary; many very fine and fine roots and common medium roots; many fine irregular pores; 25 percent gravel and 45 percent cobbles; very strongly acid; clear smooth boundary.

BC—21 to 32 inches; dark yellowish brown (10YR 4/4) extremely cobbly loam, yellowish brown (10YR 5/6) dry; weak fine and medium subangular blocky structure; soft, friable, slightly sticky and nonplastic; moderately smeary; common fine and medium roots and few coarse roots; many fine irregular and tubular pores; 40 percent gravel and 35 percent cobbles; very strongly acid; abrupt smooth boundary.

R—32 inches; basalt.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR. Moist bulk density is less than 1.00 gram per cubic centimeter.

The A horizon has value of 2 or 3 moist and 3 to 5 dry, and it has chroma of 2 or 3 moist and 3 dry. It is 35 to 60 percent rock fragments.

The B horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 4 or 5 moist and 5 or 6 dry. It is extremely gravelly loam or extremely cobbly loam and is 60 to 85 percent rock fragments.

Larmine Series

The Larmine series consists of shallow, well drained soils on side slopes, ridges, and headwalls. These soils formed in colluvium derived from sandstone. Slopes are 12 to 90 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Larmine gravelly loam in an area of Atring-Larmine complex, 30 to 60 percent slopes; 2,625 feet north and 560 feet west of the southeast corner of sec. 25, T. 24 S., R. 7 W.

A—0 to 3 inches; dark grayish brown (10YR 4/2) gravelly loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and few medium roots; many very fine tubular and irregular pores; 30 percent fine gravel; slightly acid; clear wavy boundary.

Bw1—3 to 12 inches; yellowish brown (10YR 5/4) very gravelly loam, very pale brown (10YR 7/3) dry; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine, fine, and medium tubular pores; 45 percent gravel and 10 percent cobbles; moderately acid; clear wavy boundary.

Bw2—12 to 19 inches; yellowish brown (10YR 5/4) extremely gravelly loam, very pale brown (10YR 7/4) dry; weak medium granular structure; hard, friable, slightly sticky and slightly plastic; common very fine, medium, and coarse roots; common very fine, fine, and medium irregular pores; 50 percent gravel and 20 percent cobbles; neutral; gradual wavy boundary.

R—19 inches; sandstone.

Depth to bedrock is 10 to 20 inches.

The A horizon has value of 3 to 5 moist and 6 or 7 dry, and it has chroma of 2 to 4 moist or dry.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5 moist and 6 or 7 dry, and chroma of 3 to 6 moist or dry. The horizon is very gravelly loam, extremely gravelly silt loam, or extremely gravelly loam and is 35 to 75 percent rock fragments.

Lempira Series

The Lempira series consists of very deep, well drained soils on side slopes and ridges. These soils formed in residuum and colluvium derived from volcanic rock. Slopes are 3 to 60 percent. The mean annual precipitation is about 70 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of Lempira gravelly loam in an area of Lempira-Illahee complex, 30 to 60 percent north slopes; 2,700 feet north and 300 feet west of the southeast corner of sec. 17, T. 24 S., R. 2 W.

Oi—0.5 inch to 0; slightly decomposed leaves, needles, and twigs.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) gravelly loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; slightly hard, friable, nonsticky and nonplastic; many very fine and fine roots and common medium and coarse roots; many very fine irregular pores; 15 percent gravel; very strongly acid; clear smooth boundary.

A2—4 to 14 inches; dark brown (10YR 3/3) gravelly loam, brown (10YR 5/3) dry; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium and coarse roots; many very fine irregular pores; 15 percent gravel; very strongly acid; clear wavy boundary.

A3—14 to 29 inches; dark brown (10YR 3/3) gravelly loam, brown (10YR 5/3) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine tubular pores; 15 percent gravel; very strongly acid; clear wavy boundary.

Bw1—29 to 46 inches; dark yellowish brown (10YR 3/4) gravelly loam, light yellowish brown (10YR 6/4) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine, fine, and medium roots; common very fine tubular pores; 15 percent gravel; very strongly acid; clear smooth boundary.

Bw2—46 to 60 inches; dark yellowish brown (10YR 3/4) gravelly loam, light yellowish brown (10YR 6/4) dry; moderate fine and medium subangular blocky structure; slightly hard, firm, sticky and plastic; common very fine and fine roots; common very fine tubular pores; 30 percent gravel; very strongly acid.

Depth to bedrock is 60 inches or more. Moist bulk density is less than 1.00 gram per cubic centimeter.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bw horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist and 5 to 7 dry, and chroma of 3 or 4 moist or dry. The horizon is gravelly loam, cobbly loam, or clay loam.

Leopold Series

The Leopold series consists of moderately deep, well drained soils on side slopes and broad ridges. These soils formed in colluvium and residuum derived from sandstone. Slopes are 3 to 60 percent. The mean annual precipitation is about 105 inches, and the mean annual air temperature is about 44 degrees F.

Typical pedon of Leopold clay loam, 3 to 30 percent slopes; 2,475 feet west and 500 feet north of the southeast corner of sec. 17, T. 19 S., R. 9 W.

Oi—1 inch to 0; slightly decomposed needles, twigs, and leaves.

A—0 to 5 inches; dark brown (7.5YR 3/4) clay loam, brown (7.5YR 4/4) dry; moderate fine and medium granular structure; slightly hard, friable, sticky and slightly plastic; many very fine, fine, and medium roots and few coarse roots; many very fine and fine irregular pores; 10 percent gravel; very strongly acid; clear smooth boundary.

Bw1—5 to 20 inches; brown (7.5YR 4/4) gravelly silty clay loam, yellowish brown (10YR 5/4) dry; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; common fine and medium roots and few coarse roots; common very fine and fine irregular pores; 15 percent gravel and 5 percent cobbles; very strongly acid; clear smooth boundary.

Bw2—20 to 24 inches; brown (7.5YR 4/4) very gravelly silty clay loam, light yellowish brown (10YR 6/4) dry; weak medium and coarse subangular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; common fine irregular and tubular pores; 30 percent gravel and 10 percent cobbles; very strongly acid; abrupt wavy boundary.

R—24 inches; sandstone.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 3 or 4 dry, and it has chroma of 3 or 4 moist or dry.

The Bw horizon has value of 3 or 4 moist and 5 or 6 dry, and it has chroma of 3 or 4 moist or dry. The upper part of the horizon is gravelly silty clay loam or gravelly clay loam, and the lower part, where present, is very gravelly silty clay loam. The lower part of the horizon is 35 to 50 percent rock fragments.

Lettia Series

The Lettia series consists of deep, well drained soils on footslopes, side slopes, and ridges. These soils formed in colluvium and residuum derived from granodiorite. Slopes are 3 to 70 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Lettia gravelly loam, 3 to 30 percent slopes; 2,150 feet north and 875 feet east of the southwest corner of sec. 27, T. 28 S., R. 4 W.

Oi—0.5 inch to 0; slightly decomposed needles, twigs, leaves, and grass.

A—0 to 5 inches; dark brown (10YR 3/3) gravelly loam, brown (10YR 5/3) dry; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; many very fine irregular pores; 15 percent gravel; moderately acid; abrupt smooth boundary.

AB—5 to 12 inches; dark brown (7.5YR 4/4) gravelly loam, light brown (7.5YR 6/4) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, medium, and coarse roots; many very fine irregular pores; 15 percent gravel; slightly acid; clear smooth boundary.

Bt1—12 to 16 inches; strong brown (7.5YR 4/6) loam, light brown (7.5YR 6/4) dry; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine, fine, medium, and coarse roots; many very fine, fine, and medium irregular pores; few distinct reddish brown (5YR 4/4) clay films on faces of peds and in pores; 10 percent gravel; moderately acid; clear smooth boundary.

Bt2—16 to 26 inches; strong brown (7.5YR 4/6) clay loam, strong brown (7.5YR 5/6) dry; strong medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine, fine, and medium roots; common very fine, fine, and medium irregular pores; common distinct reddish brown (5YR 4/4) clay films on faces of peds and in pores; 10 percent gravel; moderately acid; gradual wavy boundary.

Bt3—26 to 46 inches; strong brown (7.5YR 5/6) clay loam, reddish yellow (7.5YR 6/6) dry; moderate medium subangular blocky structure; extremely hard, firm, sticky and very plastic; very few fine roots; many very fine irregular pores; many distinct yellowish red (5YR 4/6) clay films on faces of peds and in pores; 10 percent gravel; slightly acid; gradual wavy boundary.

Bt4—46 to 58 inches; strong brown (7.5YR 5/6) clay loam, reddish yellow (7.5YR 6/6) dry; strong medium angular blocky structure; extremely hard, firm, sticky and very plastic; few fine irregular pores; many distinct yellowish red (5YR 4/6) clay films on faces of peds and in pores; 5 percent gravel; strongly acid; gradual wavy boundary.

Crt—58 inches; granodiorite; many prominent yellowish red (5YR 4/6) clay films along fractures.

Depth to bedrock is 40 to 60 inches.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5 moist and 4 to 7 dry, and chroma of 2 to 4 moist or dry.

The Bt horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 4 to 6 moist and 5 to 7 dry, and chroma of 4 to 8 moist or dry. The horizon is loam, sandy clay loam, or clay loam.

Limpy Series

The Limpy series consists of shallow, somewhat excessively drained soils on side slopes and headwalls. These soils formed in colluvium derived from volcanic rock. Slopes are 60 to 100 percent. The mean annual precipitation is about 70 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of Limpy extremely cobbly loam in an area of Scaredman-Limpy-Rock outcrop complex, 60 to 100 percent south slopes; 700 feet north and 1,200 feet east of the southwest corner of sec. 27, T. 24 S., R. 1 W.

Oi—0.5 inch to 0; slightly decomposed needles and twigs.

A—0 to 6 inches; dark brown (7.5YR 3/2) extremely cobbly loam, brown (7.5YR 4/2) dry; weak fine and medium granular structure; soft, friable, nonsticky and nonplastic; many fine, medium, and coarse roots; many very fine irregular pores; 35 percent gravel, 45 percent cobbles, and 3 percent stones; strongly acid; gradual wavy boundary.

Bw—6 to 19 inches; dark brown (10YR 3/3) extremely cobbly loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common medium roots and few fine and coarse roots; many very fine irregular pores; 25 percent gravel, 50 percent cobbles, and 3 percent stones; strongly acid; abrupt wavy boundary.

R—19 inches; welded tuff.

Depth to bedrock is 12 to 20 inches. The profile has hue of 10YR or 7.5YR. It is 65 to 85 percent rock fragments.

The A horizon has value of 3 or 4 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bw horizon has value of 3 or 4 moist and 4 or 5 dry, and it has chroma of 2 to 4 moist or dry. It is extremely cobbly loam or extremely cobbly sandy loam.

Lint Series

The Lint series consists of very deep, well drained soils on marine terraces. These soils formed in mixed alluvium. Slopes are 0 to 20 percent. The mean annual precipitation is about 80 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Lint silt loam, 0 to 12 percent slopes; 1,075 feet east and 180 feet south of the northwest corner of sec. 13, T. 21 S., R. 12 W.

Oi—2 inches to 0; slightly decomposed spruce needles, leaves, twigs, and roots.

A1—0 to 10 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak very fine and fine granular structure; soft, very friable, slightly sticky and nonplastic; many fine and medium roots; many very fine and fine irregular pores; 5 percent rounded gravel; very strongly acid; clear smooth boundary.

A2—10 to 19 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/3) dry; moderate very fine and fine subangular blocky structure parting to fine and medium granular; soft, friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine and fine irregular pores; very strongly acid; clear wavy boundary.

Bw1—19 to 39 inches; dark brown (10YR 3/3) silty clay loam, yellowish brown (10YR 5/4) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; common very fine, fine, and medium irregular and tubular pores; common faint coatings of silt on faces of peds and in pores; very strongly acid; clear smooth boundary.

Bw2—39 to 52 inches; dark yellowish brown (10YR 4/4) silty clay loam, yellowish brown (10YR 5/4) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; few fine roots; common very fine and fine tubular pores; common faint coatings of silt on faces of peds and in pores; very strongly acid; clear smooth boundary.

BC—52 to 62 inches; dark yellowish brown (10YR 4/4) silty clay loam, light yellowish brown (10YR 6/4) dry; weak medium and coarse subangular blocky structure; hard, firm, sticky and plastic; few fine roots; common very fine and fine tubular pores; very strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR. Moist bulk density is less than 1.00 gram per cubic centimeter.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bw horizon has value of 3 or 4 moist and 5 to 7 dry, and it has chroma of 3 or 4 moist or dry. It is silt loam or silty clay loam.

The BC horizon has value of 4 to 6 moist and 6 or 7 dry, and it has chroma of 3 or 4 moist or dry. It is silt loam or silty clay loam.

Littlesand Series

The Littlesand series consists of moderately deep, well drained soils on side slopes. These soils formed in colluvium derived from sandstone. Slopes are 60 to 90 percent. The mean annual precipitation is about 48 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of Littlesand gravelly loam in an area of Littlesand-Rosehaven-Atring complex, 60 to 90 percent slopes; 1,050 feet south and 400 feet west of the northeast corner of sec. 9, T. 21 S., R. 5 W.

Oi—2 inches to 0; slightly decomposed needles, twigs, and cones.

A—0 to 8 inches; very dark grayish brown (10YR 3/2) gravelly loam, light brownish gray (10YR 6/2) dry; strong medium and coarse granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and medium roots and common coarse roots; 15 percent gravel; moderately acid; abrupt wavy boundary.

Bw—8 to 18 inches; dark yellowish brown (10YR 4/4) gravelly clay loam, light yellowish brown (10YR 6/4) dry; strong very fine and fine subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; many very fine roots and common fine, medium, and coarse roots; 15 percent gravel; strongly acid; clear smooth boundary.

BC—18 to 29 inches; yellowish brown (10YR 5/6) cobbly clay loam, brownish yellow (10YR 6/6) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common very fine and fine roots and few medium and coarse roots; 10 percent gravel, 20 percent cobbles, and 20 percent soft sandstone fragments; very strongly acid; gradual wavy boundary.

C—29 to 39 inches; yellowish brown (10YR 5/6) cobbly clay loam, yellow (10YR 7/6) dry; massive; hard, firm, sticky and plastic; few very fine and fine roots; 5 percent gravel, 10 percent cobbles, and 50 percent soft sandstone fragments; strongly acid; clear smooth boundary.

Cr—39 inches; weathered sandstone.

Depth to bedrock is 20 to 40 inches.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist and 5 to 7 dry, and chroma of 2 to 4 moist or dry.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5 moist and 6 or 7 dry, and chroma of 4 to 6 moist. The horizon is clay loam, gravelly clay loam, or gravelly loam.

The BC horizon, where present, has value of 4 or 5 moist and 6 or 7 dry, and it has chroma of 4 to 6 moist. It is cobbly clay loam, gravelly clay loam, or cobbly loam.

The C horizon, where present, has value of 4 or 5 moist and 6 or 7 dry, and it has chroma of 4 to 8 moist. It is cobbly clay loam, gravelly clay loam, or cobbly loam.

Malabon Series

The Malabon series consists of very deep, well drained soils on flood plains and terraces. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Malabon silty clay loam, flooded, 0 to 3 percent slopes; 1,000 feet east and 350 feet north of the southwest corner of sec. 30, T. 25 S., R. 6 W.

A1—0 to 7 inches; very dark grayish brown (10YR 3/2) silty clay loam, brown (10YR 5/3) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine irregular pores; moderately acid; clear smooth boundary.

A2—7 to 13 inches; very dark grayish brown (10YR 3/2) silty clay loam, brown (10YR 5/3) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine and fine roots; many fine irregular pores; slightly acid; clear smooth boundary.

BAt—13 to 20 inches; very dark grayish brown (10YR 3/2) silty clay loam, brown (10YR 5/3) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; common very fine and fine irregular and tubular pores; common faint very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; slightly acid; clear smooth boundary.

Bt1—20 to 33 inches; very dark grayish brown (10YR 3/2) silty clay, dark brown (10YR 4/3) dry; moderate medium and coarse subangular blocky structure parting to fine and medium subangular blocky; hard, firm, sticky and plastic; common very fine roots; common very fine and fine tubular pores; common distinct brown (7.5YR 4/3) clay films on faces of peds and in pores; slightly acid; clear smooth boundary.

Bt2—33 to 43 inches; very dark grayish brown (10YR 3/2) silty clay, dark brown (10YR 4/3) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; common very fine and fine tubular pores; common distinct dark brown (7.5YR 4/2) clay films on faces of peds and in pores; neutral; clear smooth boundary.

BCt—43 to 63 inches; dark brown (7.5YR 3/2) silty clay loam, dark brown (7.5YR 4/3) dry; weak medium and coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; common very fine and fine tubular pores; very few faint clay films in pores; neutral.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bt horizon has value of 3 or 4 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist and 3 or 4 dry. Value of 3 moist is at a depth of less than 20 inches. The horizon is silty clay or silty clay loam.

The BCt horizon is clay loam or silty clay loam.

McComas Series

The McComas series consists of very deep, somewhat poorly drained soils on slump blocks. These soils formed in colluvium derived from basalt. Slopes are 3 to 30 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of McComas very gravelly loam, 3 to 30 percent slopes; 2,640 feet west and 610 feet north of the southeast corner of sec. 32, T. 25 S., R. 3 W.

A—0 to 5 inches; dark brown (7.5YR 3/4) very gravelly loam, brown (7.5YR 5/4) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine and fine irregular and tubular pores; 35 percent gravel; moderately acid; clear smooth boundary.

Bt1—5 to 13 inches; dark brown (7.5YR 3/4) very cobbly silty clay loam, brown (7.5YR 5/4) dry; few fine faint yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots and few medium roots; many very fine and fine tubular pores; many distinct dark brown (7.5YR 3/4) clay films on faces of peds and lining pores; common wormcasts; 15 percent gravel and 40 percent rounded and subangular basalt and tuffaceous sandstone cobbles; strongly acid; abrupt smooth boundary.

2Bt2—13 to 27 inches; dark grayish brown (10YR 4/2) very cobbly clay, grayish brown (10YR 5/2) dry; many medium and coarse distinct yellowish brown (10YR 5/8) mottles; weak coarse and very coarse angular blocky structure; extremely hard, extremely firm, very sticky and very plastic; common fine and medium roots along vertical faces of peds; common very fine and fine tubular pores; many prominent dark brown (7.5YR 3/4) clay films on faces of peds; 30 percent cobbles and 15 percent stones; strongly acid; gradual smooth boundary.

2C1—27 to 38 inches; dark grayish brown (2.5Y 4/2) very cobbly clay, grayish brown (2.5Y 5/2) dry; many medium and coarse prominent gray (N 5/0) mottles and many fine and medium and common coarse distinct strong brown (7.5YR 4/6) mottles; massive; extremely hard, extremely firm, very sticky and very plastic; few very fine roots; very few very fine tubular pores; 25 percent cobbles and 10 percent stones; strongly acid; clear smooth boundary.

2C2—38 to 63 inches; dark grayish brown (2.5Y 4/2) extremely stony clay, grayish brown (2.5Y 5/2) dry; many medium and coarse prominent gray (N 5/0) mottles and many fine and medium and common coarse distinct strong brown (7.5YR 4/6) mottles; massive; extremely hard, extremely firm, very sticky and very plastic; very few very fine tubular pores; 10 percent cobbles and 70 percent stones; strongly acid.

Depth to the 2Bt horizon is 13 to 25 inches. Depth to bedrock is 60 inches or more. Stones and cobbles are scattered over the surface in varying amounts.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 2 to 4 moist and 3 or 4 dry. The horizon is 35 to 60 percent rock fragments.

The Bt horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist and 4 or 5 dry, and chroma of 3 or 4 moist or dry. The horizon is very cobbly silty clay loam or very cobbly clay loam and is 35 to 60 percent rock fragments.

The 2Bt horizon has hue of 2.5Y or 10YR, value of 3 or 4 moist and 4 or 5 dry, and chroma of 2 to 4 moist or dry. The horizon is 35 to 60 percent rock fragments.

The 2C horizon has hue of 2.5Y or 10YR, value of 3 or 4 moist and 4 or 5 dry, and chroma of 2 to 4 moist or dry. The horizon is very cobbly clay, extremely cobbly clay, or extremely stony clay and is 50 to 80 percent rock fragments.

McDuff Series

The McDuff series consists of moderately deep, well drained soils on ridges and side slopes. These soils formed in colluvium and residuum derived from sandstone and siltstone. Slopes are 3 to 60 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of McDuff silty clay loam in an area of McDuff-Absaquil-Blachly complex, 30 to 60 percent slopes; 3,875 feet west and 2,060 feet north of the southeast corner of sec. 18, T. 24 S., R. 9 W.

Oi—2 inches to 0; slightly decomposed needles, leaves, twigs, and mosses.

A—0 to 7 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 5/3) dry; moderate fine and medium granular structure; slightly hard, firm, sticky and plastic; common fine and medium roots and few coarse roots; many very fine and fine irregular pores; strongly acid; clear smooth boundary.

BA—7 to 10 inches; dark brown (7.5YR 4/4) silty clay loam, brown (7.5YR 5/4) dry; moderate fine and medium subangular blocky structure; slightly hard, firm, sticky and plastic; common fine and medium roots and few coarse roots; many very fine and fine irregular pores; few faint clay films in pores; 10 percent soft siltstone gravel; strongly acid; clear smooth boundary.

Bt1—10 to 21 inches; strong brown (7.5YR 4/6) clay, strong brown (7.5YR 5/6) dry; moderate medium and coarse subangular blocky structure; hard, very firm, very sticky and very plastic; common fine and medium roots; common fine and medium tubular pores; common faint clay films on faces of peds and in pores; 10 percent soft siltstone gravel; very strongly acid; clear smooth boundary.

Bt2—21 to 24 inches; strong brown (7.5YR 4/6) clay, strong brown (7.5YR 5/6) dry; weak medium and coarse subangular blocky structure; hard, very firm, very sticky and very plastic; few fine and medium roots; common fine and medium tubular pores; common distinct clay films on faces of peds and in pores; 15 percent soft siltstone gravel; very strongly acid; clear smooth boundary.

BCt—24 to 32 inches; dark yellowish brown (10YR 4/6) clay, brownish yellow (10YR 6/6) dry; massive; hard, firm, sticky and plastic; few fine and medium roots; few fine tubular pores; common distinct clay films on rock fragments; 10 percent hard gravel and 40 percent soft siltstone gravel; very strongly acid; clear smooth boundary.

Cr—32 inches; weathered siltstone.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bt horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 3 to 6 moist or dry. The horizon is silty clay or clay and is 0 to 50 percent soft fragments.

McGinnis Series

The McGinnis series consists of moderately deep, well drained soils on side slopes and ridges. These soils formed in colluvium and residuum derived from sandstone, siltstone, and metamorphic rock. Slopes are 3 to 80 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of McGinnis very gravelly clay loam in an area of Tishar-McGinnis complex, 3 to 30 percent slopes; 2,000 feet west and 300 feet north of southeast corner of sec. 7, T. 28 S., R. 7 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 4 inches; dark brown (7.5YR 3/4) very gravelly clay loam, brown (7.5YR 5/4) dry; moderate very fine and fine granular structure; slightly hard, friable, sticky and plastic; many very fine roots and common fine, medium, and coarse roots; many very fine irregular pores; 35 percent gravel; slightly acid; clear smooth boundary.

BA—4 to 10 inches; dark brown (7.5YR 4/4) gravelly clay loam, strong brown (7.5YR 5/6) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine roots, common fine and medium roots, and few coarse roots; many very fine tubular pores; 20 percent gravel; slightly acid; abrupt wavy boundary.

Bt1—10 to 18 inches; reddish brown (5YR 4/4) very gravelly silty clay, yellowish red (5YR 5/6) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots and few fine, medium, and coarse roots; many very fine tubular pores; common distinct clay films on faces of peds and in pores; 25 percent gravel and 10 percent cobbles; moderately acid; gradual wavy boundary.

Bt2—18 to 28 inches; reddish brown (5YR 4/4) very gravelly silty clay, reddish yellow (5YR 6/6) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine, fine, medium, and coarse roots; common very fine tubular pores; many distinct clay films on faces of peds and in pores; 35 percent gravel and 15 percent cobbles; moderately acid; clear wavy boundary.

Cr—28 inches; weathered sandstone.

Depth to bedrock is 20 to 40 inches.

The A horizon has hue of 7.5YR or 5YR, value of 3 or 4 moist and 5 to 7 dry, and chroma of 3 or 4 moist and 4 to 6 dry.

The BA horizon, where present, has hue of 7.5YR or 5YR, value of 3 or 4 moist and 4 to 6 dry, and chroma of 4 to 8 moist or dry. The horizon is gravelly clay, gravelly clay loam, or very gravelly clay loam.

The Bt horizon has hue of 5YR or 2.5YR, value of 3 or 4 moist and 4 to 6 dry, and chroma of 4 to 8 moist or dry. The horizon is very gravelly clay, very gravelly silty clay, or very gravelly clay loam.

McMullin Series

The McMullin series consists of shallow, well drained soils on ridges and side slopes. These soils formed in colluvium and residuum derived from metamorphic rock. Slopes are 3 to 75 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of McMullin loam in an area of McMullin-Reston complex, 3 to 30 percent slopes; 2,410 feet south and 75 feet east of the northwest corner of sec. 28, T. 28 S., R. 6 W.

A—0 to 4 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; moderate very fine and fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine irregular pores; 5 percent gravel; strongly acid; clear smooth boundary.

Bw1—4 to 10 inches; dark brown (10YR 3/3) gravelly loam, yellowish brown (10YR 5/4) dry; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine irregular and tubular pores; few faint coatings of very fine sand and silt on faces of peds and in pores; 15 percent gravel; strongly acid; gradual smooth boundary.

Bw2—10 to 19 inches; dark yellowish brown (10YR 3/4) gravelly loam, yellowish brown (10YR 5/4) dry; moderate fine and medium subangular blocky structure; soft, friable, sticky and slightly plastic; common very fine and fine roots; many very fine and fine irregular and tubular pores; few faint clay films on faces of peds and in pores; few faint coatings of clean very fine sand and silt on faces of peds; 15 percent gravel; strongly acid; abrupt smooth boundary.

R—19 inches; greenstone.

Depth to bedrock is 12 to 20 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist and 3 or 4 dry.

The Bw horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 3 or 4 moist or dry. It is gravelly loam, gravelly clay loam, or cobbly clay loam.

McNab Series

The McNab series consists of very deep, somewhat poorly drained soils in swales. These soils formed in residuum and colluvium derived from sandstone and siltstone. Slopes are 0 to 20 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of McNab clay loam in an area of McNab-Windygap complex, 3 to 30 percent slopes; 600 feet north and 1,900 feet east of the southwest corner of sec. 17, T. 30 S., R. 9 W.

Oi—0.5 inch to 0; slightly decomposed needles and twigs.

A—0 to 6 inches; dark brown (7.5YR 3/3) clay loam, yellowish brown (10YR 5/4) dry; moderate fine granular structure; slightly hard, friable, sticky and plastic; common very fine, fine, medium, and coarse roots; many very fine irregular pores; 1 percent gravel; very strongly acid; abrupt smooth boundary.

Bt1—6 to 17 inches; brown (7.5YR 4/4) clay, light yellowish brown (10YR 6/4) dry; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine tubular pores; common faint clay films on faces of peds and in pores; 1 percent gravel; very strongly acid; clear wavy boundary.

Bt2—17 to 42 inches; yellowish brown (10YR 5/6) clay, yellowish brown (10YR 5/8) dry; many medium distinct brown (10YR 5/3), strong brown (7.5YR 5/8), and grayish brown (2.5Y 5/2) mottles; moderate medium angular blocky structure; hard, firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; common prominent clay films on faces of peds and in pores; 1 percent gravel; strongly acid; gradual wavy boundary.

Bt3—42 to 60 inches; light olive brown (2.5Y 5/4) silty clay, light brownish gray (2.5Y 6/2) dry; many coarse prominent dark yellowish brown (10YR 4/6) and grayish brown (2.5Y 5/2) mottles; moderate medium angular blocky structure; hard, firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; many distinct clay films on faces of peds and in pores; 1 percent gravel; strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has value of 2 to 4 moist and 4 or 5 dry, and it has chroma of 2 to 4 moist or dry.

The Bt horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6 moist and 5 to 7 dry, and chroma of 2 to 8 moist or dry. The horizon is clay loam, silty clay, or clay.

Meda Series

The Meda series consists of very deep, well drained soils on alluvial fans and terraces. These soils formed in mixed alluvium. Slopes are 2 to 20 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Meda loam, 2 to 20 percent slopes; 3,460 feet south and 1,375 feet west of the northeast corner of sec. 13, T. 23 S., R. 9 W.

Oi—2 inches to 0; slightly decomposed needles, leaves, and twigs.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, brown (10YR 5/3) dry; strong very fine and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots and common very fine and coarse roots; many very fine and fine irregular pores; strongly acid; clear smooth boundary.

A2—4 to 11 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; strong very fine and fine subangular blocky structure; hard, friable, sticky and plastic; many fine and medium roots and common very fine and coarse roots; common very fine and fine tubular and irregular pores; strongly acid; clear smooth boundary.

Bw1—11 to 22 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; moderate very fine, fine, and medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots and few medium roots; many very fine, common fine, and few medium tubular pores; strongly acid; clear smooth boundary.

Bw2—22 to 31 inches; dark yellowish brown (10YR 4/4) clay loam, light yellowish brown (10YR 6/4) dry; moderate very fine, fine, and medium subangular blocky structure; slightly hard, firm, sticky and plastic; few fine roots; many very fine and fine and common medium tubular pores; strongly acid; abrupt smooth boundary.

2C1—31 to 40 inches; dark yellowish brown (10YR 4/6) very gravelly sandy loam, brownish yellow (10YR 6/6) dry; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine, fine, and medium irregular and tubular pores;

50 percent gravel; very strongly acid; clear smooth boundary.

2C2—40 to 51 inches; yellowish brown (10YR 5/6) gravelly sandy loam, brownish yellow (10YR 6/6) dry; massive; soft, loose, nonsticky and nonplastic; common very fine and fine irregular pores; 30 percent gravel; very strongly acid; clear smooth boundary.

3C3—51 to 60 inches; yellowish brown (10YR 5/6) silt loam, very pale brown (10YR 7/4) dry; few fine distinct strong brown (7.5YR 5/8) mottles; massive; slightly hard, very friable, slightly sticky and nonplastic; few very fine and fine irregular pores; 10 percent gravel; very strongly acid.

Depth to bedrock is 60 inches or more. In some pedons, the part of the profile below a depth of 30 inches is extremely variable in texture and rock fragment content.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bw horizon has value of 3 or 4 moist and 5 or 6 dry, and it has chroma of 3 or 4 moist and 2 to 4 dry. It is loam or clay loam.

The 2C horizon has value of 4 or 5 moist and 5 to 7 dry, and it has chroma of 3 to 6 moist or dry. It is gravelly sandy loam or very gravelly sandy loam and is 20 to 60 percent rock fragments.

The 3C horizon has colors similar to those of the 2C horizon.

Medford Series

The Medford series consists of very deep, moderately well drained soils on terraces and alluvial fans. These soils formed in mixed alluvium. Slopes are 0 to 15 percent. The mean annual precipitation is about 40 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Medford clay loam, 0 to 7 percent slopes; 700 feet east and 2,050 feet north of the southwest corner of sec. 20, T. 29 S., R. 3 W.

A—0 to 4 inches; very dark brown (10YR 2/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium granular and subangular blocky structure; slightly hard, firm, sticky and plastic; many very fine and fine roots and common medium roots; many very fine and fine irregular pores; neutral; clear smooth boundary.

BA—4 to 8 inches; very dark brown (10YR 2/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and very plastic; many very fine and fine roots and few medium roots; many very fine, fine, and medium irregular pores; many prominent organic coatings on faces of peds; neutral; gradual smooth boundary.

Bt1—8 to 17 inches; very dark brown (10YR 2/2) clay, dark grayish brown (10YR 4/2) dry; moderate coarse prismatic structure parting to medium and coarse subangular blocky; hard, very firm, very sticky and very plastic; common fine, and few medium roots; common fine and medium tubular pores; common faint clay films on faces of peds and in pores; many prominent organic coatings on faces of peds; moderately acid; gradual smooth boundary.

Bt2—17 to 37 inches; very dark grayish brown (10YR 3/2) clay, dark brown (10YR 4/3) dry; moderate coarse prismatic structure parting to medium and coarse subangular blocky; hard, very firm, very sticky and very plastic; common fine and few medium roots; many very fine and fine and few medium tubular pores; many distinct clay films on faces of peds and in pores; common distinct organic coatings on faces of peds; moderately acid; gradual smooth boundary.

Bt3—37 to 53 inches; very dark grayish brown (10YR 3/2) clay, brown (10YR 4/3) dry; many fine distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to coarse subangular blocky; hard, very firm, very sticky and very plastic; few fine roots; common fine and medium and few coarse tubular pores; many prominent clay films on faces of peds and in pores; moderately acid; clear smooth boundary.

Bt4—53 to 60 inches; dark brown (10YR 3/3) clay, brown (10YR 4/3) dry; many fine and medium distinct yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6) mottles; weak coarse subangular blocky structure; hard, firm, very sticky and very plastic; common fine and medium and few coarse tubular pores; many prominent clay films on faces of peds and in pores; moderately acid.

Depth to bedrock is 60 inches or more.

The A horizon has value of 2 or 3 moist and 3 to 5 dry, and it has chroma of 1 or 2 moist or dry.

The Bt horizon has value of 2 to 4 moist and 4 to 6 dry, and it has chroma of 2 to 4 moist or dry. It is clay, silty clay loam, or clay loam.

Mellowmoon Series

The Mellowmoon series consists of very deep, well drained soils on side slopes and ridges. These soils formed in colluvium and residuum derived from volcanic rock. Slopes are 3 to 60 percent. The mean annual precipitation is about 70 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of Mellowmoon gravelly loam in an area of Mellowmoon-Illahee complex, 3 to 30 percent slopes; 1,050 feet east and 1,840 feet north of the southwest corner of sec. 1, T. 24 S., R. 2 W.

Oi—2 inches to 0; slightly decomposed needles, leaves, twigs, cones, and wood fragments.

A—0 to 8 inches; dark brown (10YR 3/3) gravelly loam, brown (10YR 5/3) dry; moderate very fine and fine granular structure; slightly hard, friable, sticky and slightly plastic; common very fine, fine, medium, and coarse roots; many very fine irregular pores; 20 percent gravel; very strongly acid; clear smooth boundary.

Bw1—8 to 13 inches; dark brown (10YR 3/3) loam, yellowish brown (10YR 5/4) dry; moderate fine subangular blocky structure; slightly hard, firm, sticky and slightly plastic; common very fine, fine, medium, and coarse roots; many very fine irregular pores; 10 percent gravel; very strongly acid; clear smooth boundary.

Bw2—13 to 20 inches; dark yellowish brown (10YR 4/4) clay loam, yellowish brown (10YR 5/4) dry; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots and few medium and coarse roots; many very fine tubular pores; 5 percent gravel; very strongly acid; clear wavy boundary.

Bw3—20 to 39 inches; dark yellowish brown (10YR 4/6) clay loam, brownish yellow (10YR 6/6) dry; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots and few medium and coarse roots; many very fine tubular pores; very strongly acid; clear wavy boundary.

Bw4—39 to 52 inches; dark yellowish brown (10YR 4/6) gravelly clay loam, yellow (10YR 7/6) dry; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots; many very fine tubular pores; 15 percent gravel and 5 percent cobbles; very strongly acid; clear wavy boundary.

C—52 to 60 inches; dark yellowish brown (10YR 4/6) gravelly loam, yellow (10YR 7/6) dry; weak fine and medium subangular blocky structure; slightly hard, firm, sticky and slightly plastic; few very fine roots; many very fine tubular pores; 15 percent gravel and 10 percent cobbles; very strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist and 3 or 4 dry.

The Bw and C horizons have value of 3 or 4 moist and 4 to 7 dry, and they have chroma of 3 to 6 moist and 4 or 6 dry. They are clay loam, gravelly clay loam, gravelly loam, or loam.

Millicoma Series

The Millicoma series consists of moderately deep, well drained soils on side slopes and ridges. These soils formed in colluvium derived from sandstone. Slopes are 30 to 90 percent. The mean annual precipitation is about 80 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of Millicoma gravelly loam in an area of Millicoma-Reedsport complex, 60 to 90 percent slopes; 1,700 feet west and 1,000 feet south of the northeast corner of sec. 24, T. 22 S., R. 12 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A1—0 to 4 inches; very dark brown (10YR 2/2) gravelly loam, dark grayish brown (10YR 4/2) dry; moderate very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots and common fine, medium, and coarse roots; many very fine and fine irregular pores; 15 percent gravel; very strongly acid; abrupt smooth boundary.

A2—4 to 10 inches; dark brown (10YR 3/3) gravelly loam, yellowish brown (10YR 5/4) dry; moderate very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots and common fine, medium, and coarse roots; many fine and very fine tubular pores; 15 percent gravel and 5 percent cobbles; very strongly acid; clear wavy boundary.

Bw1—10 to 18 inches; dark yellowish brown (10YR 4/4) very gravelly loam, light yellowish brown (10YR 6/4) dry; weak fine and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine roots and few fine, medium, and coarse roots; common very fine and fine tubular pores; 25 percent gravel and 10 percent cobbles; very strongly acid; clear wavy boundary.

Bw2—18 to 30 inches; dark yellowish brown (10YR 4/4) very gravelly loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine roots and few fine,

medium, and coarse roots; common very fine and fine tubular pores; 30 percent gravel and 10 percent cobbles; very strongly acid; abrupt wavy boundary.
Cr—30 inches; weathered sandstone.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 3 to 5 dry, and it has chroma of 2 or 3 moist and 2 to 4 dry.

The Bw horizon has value of 3 to 5 moist and 5 or 6 dry, and it has chroma of 2 to 4 moist or dry. It is very gravelly loam, very gravelly sandy loam, or extremely gravelly loam and is 35 to 70 percent rock fragments.

Natal Series

The Natal series consists of very deep, poorly drained soils on terraces. These soils formed in clayey alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Natal clay loam, 0 to 3 percent slopes; 1,500 feet west and 200 feet north of the southeast corner of sec. 5, T. 24 S., R. 9 W.

Oi—0.5 inch to 0; slightly decomposed leaves, needles, and twigs.

A—0 to 5 inches; very dark gray (10YR 3/1) clay loam, gray (10YR 5/1) dry; few fine distinct brown (7.5YR 4/4) mottles; strong very fine and fine granular structure; hard, friable, sticky and slightly plastic; many very fine, fine, medium, and coarse roots; many fine irregular pores; strongly acid; clear smooth boundary.

Ag—5 to 11 inches; very dark gray (10YR 3/1) clay loam, gray (10YR 5/1) dry; common fine distinct brown (7.5YR 4/4) mottles; moderate fine and medium granular and subangular blocky structure; hard, friable, very sticky and slightly plastic; many very fine and fine roots, common medium roots, and few coarse roots; many fine irregular pores; strongly acid; clear smooth boundary.

Bcg—11 to 17 inches; grayish brown (2.5Y 5/2) clay, light gray (10YR 7/2) dry; common fine distinct brown (7.5YR 4/4) mottles; moderate fine and medium subangular blocky structure; hard, firm, very sticky and slightly plastic; common fine and medium roots and few coarse roots; common fine irregular pores; very few manganese stains on faces of peds; 5 percent rounded manganese nodules; strongly acid; clear smooth boundary.

Btcg1—17 to 26 inches; grayish brown (2.5Y 5/2) clay, light gray (2.5Y 7/2) dry; common medium yellowish red (5YR 5/8) and strong brown (7.5YR 5/8) mottles; moderate medium and coarse subangular blocky structure; hard, firm, very sticky and slightly plastic; common fine and medium roots; common very fine and fine tubular pores; few faint clay films in pores; 5 percent rounded manganese nodules; strongly acid; clear smooth boundary.

Btcg2—26 to 33 inches; grayish brown (2.5Y 5/2) clay, light gray (10YR 7/1) dry; common medium yellowish red (5YR 5/8) and strong brown (7.5YR 5/8) mottles; moderate medium and coarse subangular blocky structure; very hard, firm, very sticky and slightly plastic; few fine and medium roots; few very fine and fine tubular pores; few faint clay films on faces of peds and in pores; 5 percent rounded manganese nodules; strongly acid; clear smooth boundary.

Btcg3—33 to 45 inches; grayish brown (2.5Y 5/2) clay, light gray (10YR 7/1) dry; common medium strong brown (7.5YR 5/8) and brownish yellow (10YR 6/8) mottles; weak medium prismatic structure parting to weak medium subangular blocky; very hard, firm, very sticky and slightly plastic; few fine roots; few very fine tubular pores; common faint clay films on faces of peds and in pores; few manganese stains on faces of peds; 5 percent rounded manganese nodules; strongly acid; abrupt smooth boundary.

Btg—45 to 60 inches; gray (2.5Y 5/1) clay, light gray (2.5Y 7/1) dry; common medium yellowish red (5YR 5/8) and strong brown (7.5YR 5/8) mottles; weak medium and coarse prismatic structure parting to weak medium and coarse subangular blocky; very hard, firm, very sticky and slightly plastic; few very fine and fine tubular pores; common distinct clay films on faces of peds and in pores; very strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 2.5Y. Mottles that are a result of wetness are throughout the profile.

The A horizon has value of 2 or 3 moist and 3 to 5 dry, and it has chroma of 1 or 2 moist or dry.

The Bt horizon has value of 3 or 5 moist and 5 to 7 dry, and it has chroma of 1 or 2 moist or dry. It is clay or silty clay.

The Natal soils in this survey area are a taxadjunct to the Natal series because they are classified as Mollic Endoaqualfs.

Natroy Series

The Natroy series consists of very deep, poorly drained soils on terraces and alluvial fans. These soils formed in clayey alluvium. Slopes are 0 to 2 percent.

The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Natroy clay, 0 to 2 percent slopes (fig. 21, p. 556); 660 feet south and 350 feet east of the northwest corner of sec. 3, T. 27 S., R. 6 W.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) clay, dark grayish brown (10YR 4/2) dry; common fine distinct yellowish brown (10YR 5/6) and gray (10YR 5/1) mottles; strong very fine and fine subangular blocky and granular structure; extremely hard, extremely firm, very sticky and very plastic; many very fine and fine roots and common medium roots; many very fine and fine irregular pores; moderately acid; clear smooth boundary.

A2—4 to 18 inches; very dark gray (10YR 3/1) clay, dark grayish brown (10YR 4/2) dry; many fine and medium yellowish brown (10YR 5/6) mottles; strong coarse prismatic structure parting to medium and coarse subangular blocky; extremely hard, extremely firm, very sticky and very plastic; many very fine and fine roots; few very fine tubular pores; many pressure faces; 5 percent basalt gravel; moderately acid; gradual smooth boundary.

Bss—18 to 40 inches; very dark grayish brown (10YR 3/2) clay, dark grayish brown (10YR 4/2) dry; common fine faint yellowish brown (10YR 5/8) mottles; strong very coarse prismatic structure parting to coarse angular blocky; extremely hard, extremely firm, very sticky and very plastic; common very fine roots concentrated along faces of peds; few very fine tubular pores; many pressure faces; common fine and coarse intersecting slickensides; 5 percent basalt gravel; moderately acid; gradual smooth boundary.

2Bt—40 to 53 inches; dark brown (10YR 4/3) clay, yellowish brown (10YR 5/4) dry; common fine and medium faint light yellowish brown (10YR 6/4) mottles; weak medium and coarse angular blocky structure; extremely hard, extremely firm, very sticky and very plastic; common very fine and fine roots along faces of peds; few very fine tubular pores; few pressure faces; many distinct dark brown (10YR 4/3) clay films on faces of peds and in pores; 10 percent basalt gravel; neutral; clear smooth boundary.

2BCt—53 to 60 inches; dark yellowish brown (10YR 4/4) gravelly clay, yellowish brown (10YR 5/4) dry; common fine and medium faint light yellowish brown (10YR 6/4) mottles; weak fine and medium subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds and in pores; 30 percent basalt gravel; slightly alkaline.

Depth to bedrock is 60 inches or more. The profile has cracks that are open for 60 consecutive days or more in summer and are closed for 60 consecutive days or more in winter. Mottles that are a result of wetness are throughout the profile. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 3 or 4 dry. The upper part to a depth of 12 inches commonly has chroma of 2, but it has chroma of 1 in some pedons. The lower part has chroma of 1 to 3 moist and 2 or 3 dry.

The Bss horizon has value of 2 or 3 moist and 3 or 4 dry, and it has chroma of 1 to 3 moist and 2 or 3 dry.

The 2Bt horizon has value of 3 to 5 moist and 4 to 6 dry, and it has chroma of 2 to 4 moist or dry. It is clay, gravelly clay, or sandy clay.

Nekia Series

The Nekia series consists of moderately deep, well drained soils on toeslopes, footslopes, side slopes, and ridges. These soils formed in residuum and colluvium derived from basalt. Slopes are 2 to 60 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Nekia silty clay loam in an area of Nekia-Jory complex, 30 to 60 percent slopes; 1,700 feet east and 300 feet south of the northwest corner of sec. 25, T. 22 S., R. 6 W.

Oi—2 inches to 0; slightly decomposed coniferous and deciduous litter.

A—0 to 8 inches; dark reddish brown (5YR 3/2) silty clay loam, reddish brown (5YR 4/3) dry; strong fine and medium granular structure; soft, very friable, slightly sticky and plastic; many very fine, fine, and medium roots and common coarse roots; many very fine irregular pores; moderately acid; gradual smooth boundary.

Bt1—8 to 19 inches; dark reddish brown (5YR 3/3) silty clay, yellowish red (5YR 4/6) dry; moderate medium and coarse granular structure; soft, very friable, sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine tubular pores; strongly acid; clear wavy boundary.

Bt2—19 to 29 inches; dark reddish brown (5YR 3/4) gravelly clay, yellowish red (5YR 4/6) dry; strong very fine and fine subangular blocky structure;

slightly hard, friable, sticky and plastic; common very fine, fine, and medium roots and few coarse roots; common very fine tubular pores; 20 percent gravel and 10 percent cobbles; very strongly acid; abrupt irregular boundary.

R—29 inches; basalt.

Depth to bedrock is 20 to 40 inches.

The A horizon has hue of 7.5YR or 5YR, value of 2 or 3 moist, and chroma of 2 or 3.

The Bt horizon has hue of 5YR or 2.5YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 3 or 4 moist and 4 to 6 dry. The horizon is silty clay, clay, or gravelly clay.

Nekoma Series

The Nekoma series consists of very deep, well drained soils on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Nekoma silt loam in an area of Kirkendall-Nekoma complex, 0 to 3 percent slopes; 1,865 feet east and 620 feet north of the southwest corner of sec. 28, T. 20 S., R. 7 W.

Oi—2 inches to 0; slightly decomposed needles and twigs.

A1—0 to 8 inches; very dark brown (10YR 2/2) silt loam, dark brown (10YR 3/3) dry; moderate very fine and fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many very fine and fine irregular pores; moderately acid; clear smooth boundary.

A2—8 to 14 inches; dark brown (7.5YR 3/2) silt loam, brown (10YR 4/3) dry; moderate fine and medium subangular and granular structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many very fine and fine irregular pores; strongly acid; clear smooth boundary.

Bw—14 to 27 inches; dark yellowish brown (10YR 3/4) silt loam, yellowish brown (10YR 5/4) dry; weak medium and coarse subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common fine and medium roots and few coarse roots; many very fine and fine tubular pores; strongly acid; clear smooth boundary.

BC—27 to 32 inches; dark yellowish brown (10YR 3/4) very fine sandy loam, light yellowish brown (10YR 6/4) dry; weak medium and coarse subangular blocky structure; soft, friable, sticky and slightly plastic; few fine roots; common very fine and fine tubular pores; strongly acid; clear smooth boundary.

C1—32 to 45 inches; dark yellowish brown (10YR 4/4) fine sand, light yellowish brown (10YR 6/4) dry; massive; loose, nonsticky and nonplastic; few very fine irregular pores; strongly acid; clear smooth boundary.

C2—45 to 60 inches; dark yellowish brown (10YR 4/4) fine sand, light yellowish brown (10YR 6/4) dry; massive; loose, nonsticky and nonplastic; few very fine irregular pores; strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 moist and 3 to 5 dry, and chroma of 2 or 3 moist or dry.

The Bw horizon has value of 3 to 5 moist and 5 to 7 dry, and it has chroma of 3 to 6 moist or dry. It is silt loam, loam, or fine sandy loam.

The C horizon has value of 3 to 6 moist and 5 to 7 dry, and it has chroma of 3 to 6 moist or dry. It is stratified very fine sandy loam to loamy fine sand.

Nestucca Series

The Nestucca series consists of very deep, somewhat poorly drained soils on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 80 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Nestucca silt loam, 0 to 3 percent slopes; 1,500 feet north and 10 feet east of the southwest corner of sec. 6, T. 22 S., R. 10 W.

A1—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and few fine roots; many very fine irregular pores; very strongly acid; clear smooth boundary.

A2—10 to 15 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine irregular pores; very strongly acid; abrupt wavy boundary.

Bg1—15 to 30 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; many medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; very strongly acid; clear wavy boundary.

Bg2—30 to 60 inches; gray (10YR 5/1) silty clay loam, light gray (10YR 7/2) dry; many medium prominent strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; slightly hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; very strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 1 to 3 moist or dry.

The Bg horizon has hue of 2.5Y or 10YR, value of 4 or 5 moist and 5 to 7 dry, and chroma of 1 or 2 moist or dry. The horizon is silt loam or silty clay loam.

Netarts Series

The Netarts series consists of very deep, well drained soils on stabilized sand dunes (fig. 22, p. 556). These soils formed in eolian sand. Slopes are 2 to 30 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Netarts fine sand, 2 to 12 percent slopes; 200 feet west and 100 feet north of the southeast corner of sec. 25, T. 22 S., R. 13 W.

Oi—3 inches to 0; slightly decomposed needles and leaves.

E—0 to 5 inches; dark grayish brown (10YR 4/2) fine sand, light brownish gray (10YR 6/2) dry; single grain; loose, nonsticky and nonplastic; many very fine and fine roots, common medium roots, and few coarse roots; many very fine irregular pores; extremely acid; clear wavy boundary.

Bs1—5 to 13 inches; brown (10YR 5/3) and dark brown (7.5YR 4/4) fine sand, light brownish gray (2.5Y 6/2) and light olive brown (2.5Y 5/6) dry; single grain; loose, nonsticky and nonplastic; few slightly hard, firm lenses and nodules that have dark brown stains; common fine and medium roots and few coarse roots; many very fine irregular pores; strongly acid; clear wavy boundary.

Bs2—13 to 21 inches; light yellowish brown (2.5Y 6/4), olive brown (2.5Y 4/4), and dark brown (10YR 4/3) fine sand, pale yellow (2.5Y 7/4) and olive yellow (2.5Y 6/6) dry; massive; common weakly cemented and few strongly cemented fragments and nodules; firm and very firm; few fine and medium roots; strongly acid; clear smooth boundary.

BCs—21 to 30 inches; light olive brown (2.5Y 5/4) and olive brown (2.5Y 4/4) fine sand, light yellowish brown (2.5Y 6/4) and light olive brown (2.5Y 5/4) dry; massive; common weakly cemented fragments and nodules; few medium roots; strongly acid; clear smooth boundary.

C1—30 to 45 inches; light olive brown (2.5Y 5/4) fine sand, light gray (2.5Y 7/2) dry; single grain; loose, nonsticky and nonplastic; few weakly cemented fragments; few medium roots; strongly acid; gradual smooth boundary.

C2—45 to 63 inches; light olive brown (2.5Y 5/4) fine sand, light gray (2.5Y 7/2) dry; single grain; loose, nonsticky and nonplastic; strongly acid.

Depth to bedrock is 60 inches or more.

Some pedons have an A horizon that has value of 2 or 3 dry and chroma of 1 or 2 moist and 2 or 3 dry.

The E horizon has hue of 2.5Y or 10YR, value of 4 to 6 moist, and chroma of 1 or 2.

The Bs horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 3 to 6 moist and 4 to 8 dry, and chroma of 2 to 6 moist or dry. The horizon has few or many weakly cemented to strongly cemented iron nodules and fragments. It has few to common thin to moderately thick lenses or stratified layers that are weakly cemented or moderately cemented. The Bs horizon is loamy fine sand, fine sand, or sand.

The C horizon has value of 4 to 7 moist, and it has chroma of 2 to 4 moist.

Newberg Series

The Newberg series consists of very deep, somewhat excessively drained soils on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Newberg fine sandy loam in an area of Camas-Newberg complex, 0 to 3 percent slopes; 400 feet east and 600 feet south of the northwest corner of sec. 3, T. 33 S., R. 6 W.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) fine sandy loam, dark yellowish brown (10YR 4/4) dry; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots; many very fine irregular pores; moderately acid; clear smooth boundary.

A2—4 to 19 inches; dark brown (10YR 3/3) fine sandy loam, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; common very fine tubular pores; slightly acid; clear wavy boundary.

C1—19 to 35 inches; dark yellowish brown (10YR 3/4) fine sandy loam, yellowish brown (10YR 5/4) dry; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; common very fine tubular pores; slightly acid; gradual wavy boundary.

C2—35 to 60 inches; dark yellowish brown (10YR 3/4) loamy fine sand, yellowish brown (10YR 5/4) dry; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; common very fine tubular pores; 13 percent gravel; slightly acid.

Depth to bedrock is 60 inches or more.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist and 3 or 4 dry. It is fine sandy loam or loamy sand.

The C horizon has value of 3 or 4 moist and 5 or 6 dry, and it has chroma of 2 to 4 moist or dry. It is fine sandy loam, sandy loam, loamy sand, loamy fine sand, or fine sand. Very gravelly substrata commonly are below a depth of 40 inches.

Nonpareil Series

The Nonpareil series consists of shallow, well drained soils on toeslopes, side slopes, ridges, and headwalls. These soils formed in colluvium and residuum derived from sandstone and siltstone. Slopes are 3 to 90 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Nonpareil loam, 3 to 12 percent slopes; 1,900 feet east and 700 feet south of the northwest corner of sec. 12, T. 25 S., R. 5 W.

A—0 to 4 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; moderate fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; very strongly acid; clear smooth boundary.

Bw1—4 to 14 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak medium prismatic structure parting to moderate fine subangular blocky; hard, friable, sticky and plastic; common very fine roots; many very fine tubular pores; 10 percent soft gravel; very strongly acid; clear wavy boundary.

Bw2—14 to 17 inches; dark yellowish brown (10YR 4/4) loam, light yellowish brown (10YR 6/4) dry; moderate fine subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; many very fine tubular pores; 15 percent soft gravel; very strongly acid; gradual wavy boundary.

Crt—17 inches; weathered sandstone; common black (10YR 2/1) stains and thick reddish brown (5YR 4/5) clay films in fractures.

Depth to bedrock is 10 to 20 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 3 or 4 moist and 6 or 7 dry, and it has chroma of 2 to 4 moist or dry.

The Bw horizon has value of 3 or 4 moist and 6 or 7 dry, and it has chroma of 3 or 4 moist or dry. It is loam, silt loam, or clay loam.

Norling Series

The Norling series consists of moderately deep, well drained soils on side slopes. These soils formed in colluvium and residuum derived from metamorphic rock. Slopes are 30 to 60 percent. The mean annual precipitation is about 50 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Norling gravelly loam in an area of Acker-Norling complex, 30 to 60 percent south slopes; 1,200 feet west and 400 feet south of the northeast corner of sec. 33, T. 31 S., R. 4 W.

Oi—2 inches to 0; slightly decomposed needles, leaves, and twigs.

A1—0 to 6 inches; brown (7.5YR 4/4) gravelly loam, light brown (7.5YR 6/4) dry; strong fine and medium granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; 25 percent gravel; moderately acid; abrupt smooth boundary.

A2—6 to 10 inches; brown (7.5YR 4/4) gravelly loam, light brown (7.5YR 6/4) dry; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine, fine, medium, and coarse roots; 15 percent gravel; strongly acid; abrupt smooth boundary.

Bt1—10 to 16 inches; strong brown (7.5YR 4/6) gravelly clay loam, pink (7.5YR 7/4) dry; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few faint yellowish red (5YR 4/6) clay films on faces of peds and in pores; 15 percent gravel and 5 percent cobbles; strongly acid; abrupt wavy boundary.

Bt2—16 to 23 inches; strong brown (7.5YR 4/6) very gravelly clay loam, pink (7.5YR 7/4) dry; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; many distinct strong brown (7.5YR 4/6) clay films on faces of peds and in pores; 35 percent gravel and 5 percent cobbles; strongly acid; clear wavy boundary.

R—23 inches; metavolcanic rock.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 2 to 4 moist and 3 or 4 dry.

The Bt horizon has value of 3 to 5 moist and 5 to 7 dry, and it has chroma of 3 to 6 moist or dry. The upper part is gravelly clay loam, clay loam, or gravelly loam, and the lower part is very gravelly loam, very gravelly clay loam, or very cobbly clay loam. The lower part is as much as 50 percent rock fragments.

Oakland Series

The Oakland series consists of moderately deep, well drained soils on toeslopes, footslopes, side slopes, and ridges. These soils formed in colluvium and residuum derived from sandstone and siltstone. Slopes are 3 to 60 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Oakland silt loam in an area of Nonpareil-Oakland complex, 3 to 12 percent slopes; 2,550 feet north and 900 feet west of the southeast corner of sec. 22, T. 25 S., R. 6 W.

A—0 to 5 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate fine and medium granular structure and very fine and fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine and fine irregular pores; few faint very pale brown (10YR 7/3) coatings of silt on vertical faces of peds and in pores; moderately acid; clear wavy boundary.

BA—5 to 10 inches; dark yellowish brown (10YR 4/4) silty clay loam, light yellowish brown (10YR 6/4) dry; weak coarse prismatic structure and moderate medium and coarse subangular blocky; hard, firm, sticky and very plastic; common fine roots; many very fine and fine tubular pores; common distinct very pale brown (10YR 7/3) coatings of silt on vertical faces of peds and in pores; 5 percent soft sandstone gravel; moderately acid; clear smooth boundary.

Bt1—10 to 20 inches; dark yellowish brown (10YR 4/4) silty clay loam, light yellowish brown (10YR 6/4) dry; moderate coarse and very coarse subangular blocky structure parting to medium and coarse subangular blocky; hard, firm, very sticky and very plastic; common fine roots; common very fine and fine irregular and tubular pores; common distinct clay films on faces of peds and in pores; many faint to distinct light gray (10YR 7/2) coatings of silt on vertical faces of peds and in pores; 10 percent soft sandstone gravel; strongly acid; clear smooth boundary.

Bt2—20 to 24 inches; dark yellowish brown (10YR 4/4) silty clay, light yellowish brown (10YR 6/4) dry; moderate medium and coarse subangular blocky structure; hard, firm, very sticky and very plastic; common very fine and fine roots; many fine and medium irregular and tubular pores; common distinct clay films on faces of peds and in pores; many prominent very pale brown (10YR 7/5) coatings of silt on vertical faces of peds; 15 percent soft sandstone gravel; strongly acid; abrupt smooth boundary.

BCt—24 to 28 inches; dark brown (10YR 4/3) gravelly silty clay, dark yellowish brown (10YR 4/4) dry; mixed brownish yellow (10YR 6/8) and strong brown (7.5YR 5/8) variegations; weak fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; common fine roots; common fine irregular pores; common distinct clay films on faces of peds; many prominent black (10YR 2/1) manganese stains; 40 percent soft sandstone gravel and 15 percent hard gravel; strongly acid; abrupt smooth boundary.

Crt—28 inches; weathered sandstone; many prominent very dark brown (10YR 2/2) manganese stains and brownish yellow (10YR 6/6) clay films; few prominent clay films; common fine roots in fractures.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 3 or 4 moist and 5 or 6 dry, and it has chroma of 3 or 4 moist or dry.

The Bt horizon has value of 3 or 4 moist and 5 or 6 dry, and it has chroma of 3 or 4 moist or dry. It is silty clay loam, silty clay, or clay.

The BCt horizon, where present, has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 3 to 6 moist or dry. It is gravelly silty clay or silty clay.

Oneonta Series

The Oneonta series consists of very deep, well drained soils on ridges and side slopes. These soils formed in colluvium and residuum derived from volcanic rock. Slopes are 3 to 60 percent. The mean annual precipitation is about 70 inches, and the mean annual air temperature is about 42 degrees F.

Typical pedon of Oneonta gravelly loam in an area of Oneonta-Keel complex, 3 to 30 percent slopes;

2,000 feet north and 100 feet west of the southeast corner of sec. 35, T. 23 S., R. 2 W.

Oi—2 inches to 0; slightly decomposed leaves and twigs.

A1—0 to 5 inches; very dark brown (10YR 2/2) gravelly loam, dark brown (10YR 3/3) dry; strong very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and medium roots and common fine and coarse roots; many very fine irregular pores; 10 percent gravel and 5 percent cobbles; strongly acid; clear wavy boundary.

A2—5 to 11 inches; very dark brown (10YR 2/2) loam, brown (10YR 4/3) dry; strong fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots and few fine, medium, and coarse roots; many very fine irregular pores; 3 percent gravel and 2 percent cobbles; strongly acid; clear wavy boundary.

AB—11 to 18 inches; dark brown (7.5YR 3/2) loam, brown (10YR 4/3) dry; moderate very fine and fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots and few fine, medium, and coarse roots; common very fine tubular pores; 3 percent gravel; strongly acid; clear wavy boundary.

Bw1—18 to 34 inches; dark brown (7.5YR 3/3) loam, yellowish brown (10YR 5/4) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly hard and slightly plastic; few very fine, fine, and medium roots; common very fine tubular pores; 3 percent gravel; very strongly acid; clear wavy boundary.

Bw2—34 to 60 inches; dark yellowish brown (10YR 4/4) loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; 35 percent soft gravel; very strongly acid.

Depth to bedrock is 60 inches or more. Moist bulk density is less than 1.00 gram per cubic centimeter. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 3 to 5 dry, and it has chroma of 2 or 3 moist or dry. The upper part is gravelly loam, and the lower part is loam or gravelly loam.

The Bw horizon has value of 3 or 4 moist and 5 to 7 dry, and it has chroma of 3 or 4 moist or dry. It is loam, gravelly loam, or clay loam. The lower part is as much as 50 percent soft rock fragments.

Orford Series

The Orford series consists of very deep, well drained soils on footslopes, side slopes, and ridges. These soils formed in residuum and colluvium derived from sandstone, siltstone, and volcanic rock. Slopes are 3 to 60 percent. The mean annual precipitation is about 80 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Orford gravelly silt loam, 3 to 30 percent slopes; 2,110 feet south and 790 feet west of the northeast corner of sec. 13, T. 21 S., R. 6 W.

Oi—2 inches to 0; slightly decomposed leaves, twigs, and needles.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) gravelly silt loam, brown (10YR 5/3) dry; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many very fine and fine irregular pores; 25 percent gravel 2 to 10 millimeters in diameter; strongly acid; clear smooth boundary.

A2—5 to 12 inches; dark brown (7.5YR 3/4) gravelly silt loam, yellowish brown (10YR 5/4) dry; moderate fine and medium subangular blocky structure parting to fine and medium granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine irregular pores; 20 percent gravel 2 to 10 millimeters in diameter; strongly acid; clear smooth boundary.

BA—12 to 22 inches; dark brown (7.5YR 3/4) silty clay loam, yellowish brown (10YR 5/4) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots and few coarse roots; common very fine, fine, and medium irregular and tubular pores; 10 percent gravel; very strongly acid; clear smooth boundary.

Bt1—22 to 32 inches; brown (7.5YR 4/4) clay, brown (7.5YR 5/4) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; few medium roots; common very fine and fine tubular pores; many distinct clay films on faces of peds and in pores; 5 percent gravel; very strongly acid; gradual smooth boundary.

Bt2—32 to 52 inches; brown (7.5YR 4/4) clay, strong brown (7.5YR 4/6) dry; moderate medium and coarse subangular blocky structure; hard, firm, very sticky and very plastic; few fine roots; common very fine and fine tubular pores; many distinct clay films on faces of peds and in pores;

5 percent gravel; very strongly acid; gradual smooth boundary.

BCt—52 to 60 inches; strong brown (7.5YR 4/6) silty clay loam, strong brown (7.5YR 5/6) dry; weak medium and coarse subangular blocky structure; hard, firm, sticky and plastic; few fine tubular pores; many distinct clay films on faces of peds, in pores, and as coatings on rock fragments; 30 percent soft siltstone gravel; very strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 to 4 moist and 3 to 6 dry, and it has chroma of 2 to 4 moist or dry. It is gravelly loam or gravelly silt loam.

The Bt horizon has value of 3 to 5 moist and 4 to 7 dry, and it has chroma of 4 to 6 moist or dry. It is clay, silty clay, silty clay loam, or clay loam.

The BC horizon and the C horizon, where present, have value of 4 to 6 moist and 5 to 7 dry, and they have chroma of 4 to 8 moist or dry. They are clay loam, clay, silty clay loam, silty clay, gravelly silty clay, or gravelly clay loam. They are as much as 60 percent soft rock fragments in some pedons.

Packard Series

The Packard series consists of very deep, well drained soils on terraces and flood plains (fig. 23, p. 557). These soils formed in mixed alluvium. Slopes are 0 to 5 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Packard gravelly loam, 0 to 5 percent slopes; 1,730 feet west and 1,400 feet south of the northeast corner of sec. 7, R. 25 S., R. 4 W.

Ap—0 to 12 inches; very dark grayish brown (10YR 3/2) gravelly loam, dark grayish brown (10YR 4/2) dry; moderate very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular pores; 25 percent fine gravel; slightly acid; abrupt smooth boundary.

Bw1—12 to 21 inches; dark brown (10YR 3/3) gravelly clay loam, dark brown (10YR 4/3) dry; moderate very fine subangular blocky structure; hard, friable, sticky and slightly plastic; many very fine roots; many very fine irregular pores; 25 percent fine gravel; slightly acid; clear smooth boundary.

Bw2—21 to 32 inches; dark brown (7.5YR 3/3) very gravelly clay loam, dark brown (10YR 4/3) dry; moderate very fine subangular blocky structure; hard, friable, sticky and slightly plastic; common very fine roots; many very fine irregular and tubular pores; 25 percent gravel and 15 percent cobbles; slightly acid; clear wavy boundary.

C—32 to 60 inches; reddish brown (5YR 4/4) extremely gravelly clay loam, reddish brown (5YR 5/4) dry; massive; hard, friable, sticky and slightly plastic; few very fine roots; many very fine irregular pores; 45 percent gravel and 20 percent cobbles; slightly acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 2 or 3 moist or dry.

The Bw horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist and 4 or 5 dry, and chroma of 2 or 3 moist and 3 or 4 dry. Value of 4 moist is below a depth of 20 inches. The horizon is very gravelly clay loam, gravelly clay loam, or very gravelly loam and is 20 to 50 percent rock fragments.

The C horizon has hue of 7.5YR or 5YR, value of 3 or 4 moist and 4 or 5 dry, and chroma of 3 or 4 moist or dry. The horizon is very gravelly clay loam, extremely gravelly clay loam, or extremely gravelly loam and is 45 to 75 percent rock fragments.

Panther Series

The Panther series consists of very deep, poorly drained soils in swales. These soils formed in colluvium and residuum derived from sandstone, siltstone, and basalt. Slopes are 4 to 20 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Panther silty clay loam, 4 to 20 percent slopes; 1,100 feet north and 250 feet west of the southeast corner of sec. 31, T. 25 S., R. 3 W.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; many fine distinct gray (10YR 5/1) mottles; moderate fine and medium granular structure; slightly hard, friable, sticky and plastic; many very fine and fine roots; many very fine and fine irregular pores; moderately acid; abrupt smooth boundary.

A2—3 to 11 inches; black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; many fine and medium distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/8) mottles; weak fine prismatic structure parting to fine and medium subangular blocky; hard, very firm, very sticky and very plastic; many very fine and fine roots; common very fine and fine tubular pores; many distinct organic coatings on faces of peds and in pores;

few fine shot fragments; moderately acid; clear smooth boundary.

Bg1—11 to 18 inches; dark gray (10YR 4/1) clay, gray (10YR 6/1) dry; many fine and medium prominent yellowish brown (10YR 5/6) mottles; moderate medium and coarse prismatic structure parting to fine and medium subangular blocky; very hard, very firm, very sticky and very plastic; common very fine and fine roots; many very fine and fine tubular pores; few fine shot fragments; strongly acid; clear smooth boundary.

Bg2—18 to 34 inches; dark gray (10YR 4/1) clay, gray (10YR 5/1) dry; many fine and medium and few coarse prominent yellowish brown (10YR 5/6) mottles; massive; very hard, very firm, very sticky and very plastic; few fine roots; many very fine and fine tubular pores; strongly acid; gradual smooth boundary.

Cg—34 to 63 inches; gray (10YR 5/1) clay, gray (10YR 6/1) dry; massive; very hard, very firm, very sticky and very plastic; few fine roots; few very fine tubular pores; 5 percent weathered tuff gravel; strongly acid.

Depth to bedrock is 60 inches or more. Mottles that are a result of wetness are throughout the profile.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 moist and 3 to 5 dry, and chroma of 1 or 2 moist or dry.

The Bg horizon has hue of 2.5Y or 10YR, value of 3 to 5 moist and 4 to 6 dry, and chroma of 1 to 3 moist or dry.

The Cg horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 4 to 6 moist or dry, and chroma of 1 or 2 moist or dry.

Pearsoll Series

The Pearsoll series consists of shallow, well drained soils on side slopes and ridges. These soils formed in colluvium and residuum derived from serpentinite or peridotite. Slopes are 5 to 70 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of Pearsoll extremely stony clay loam in an area of Pearsoll-Dubakella complex, 30 to 70 percent south slopes; 2,460 feet east and 1,375 feet south of the northwest corner of sec. 35, T. 29 S., R. 6 W.

A—0 to 6 inches; dark reddish brown (5YR 3/2) extremely stony clay loam, reddish brown (5YR 4/3) dry; moderate very fine and fine granular structure; soft, firm, sticky and plastic; many very fine and fine roots and common medium roots; many very fine and fine irregular pores; stones cover 10 percent of surface; 25 percent gravel and 35 percent cobbles; slightly acid; clear wavy boundary.

Bw—6 to 14 inches; dark reddish brown (5YR 3/4) extremely cobbly clay, reddish brown (5YR 5/4) dry; weak very fine and fine subangular blocky structure; soft, firm, sticky and very plastic; common very fine and fine roots and few medium roots; many very fine and fine irregular pores; 5 percent gravel, 60 percent cobbles, and 15 percent stones; neutral; abrupt wavy boundary.

R—14 inches; serpentinitic rock.

Depth to bedrock is 10 to 20 inches. The profile is 35 to 70 percent rock fragments. Stones cover 3 to 15 percent of the surface.

The A horizon has hue of 7.5YR or 5YR, value of 3 or 4 dry, and chroma of 2 or 3 moist and 3 or 4 dry.

The Bw horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 4 or 5 dry, and chroma of 4 to 6 moist or dry. The horizon is very cobbly clay or extremely cobbly clay.

Peavine Series

The Peavine series consists of moderately deep, well drained soils on side slopes and ridges. These soils formed in residuum and colluvium derived from sandstone, siltstone, and volcanic rock. Slopes are 3 to 60 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Peavine silty clay loam in an area of Honeygrove-Peavine complex, 3 to 30 percent slopes; 1,700 feet west and 700 feet south of the northeast corner of sec. 1, T. 23 S., R. 4 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 5 inches; dark reddish brown (5YR 3/3) silty clay loam, dark brown (7.5YR 4/3) dry; strong fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots, common fine roots, and few medium and coarse roots; many very fine irregular pores; strongly acid; abrupt smooth boundary.

AB—5 to 13 inches; dark reddish brown (5YR 3/3) clay, reddish brown (5YR 4/3) dry; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine roots and few fine, medium, and coarse roots; many very fine tubular pores; very strongly acid; clear wavy boundary.

Bt—13 to 31 inches; dark reddish brown (5YR 3/4) clay, reddish brown (5YR 4/4) dry; moderate medium and coarse angular blocky structure; very hard, firm, sticky and plastic; few very fine, fine, medium, and coarse roots; common very fine tubular pores; many prominent clay films on faces of peds and in pores; very strongly acid; abrupt wavy boundary.
Cr—31 inches; weathered basalt.

Depth to bedrock is 20 to 40 inches.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 2 to 4 moist or dry.

The Bt horizon has hue of 5YR or 2.5YR, value of 3 or 4 moist and 4 to 6 dry, and chroma of 4 to 8 moist or dry. The horizon is silty clay or clay.

Peel Series

The Peel series consists of moderately deep, moderately well drained soils on footslopes. These soils formed in colluvium derived from serpentinite and peridotite. Slopes are 3 to 30 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Peel clay loam, 3 to 30 percent slopes; 300 feet north and 1,900 feet east of the southwest corner of sec. 18, T. 29 S., R. 5 W.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate very fine granular structure and moderate fine subangular blocky; hard, friable, sticky and plastic; many very fine and medium roots; many very fine tubular pores; 10 percent gravel; slightly acid; abrupt smooth boundary.
A2—3 to 9 inches; very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium subangular blocky structure; very hard, firm, sticky and plastic; many very fine and medium roots; many very fine tubular pores; 10 percent gravel; neutral; clear smooth boundary.
Bt—9 to 24 inches; dark brown (7.5YR 3/2) gravelly clay, dark brown (7.5YR 4/2) dry; moderate fine subangular blocky structure; very hard, very firm, very sticky and very plastic; common fine and coarse roots; many fine and few medium tubular pores; 25 percent gravel; common distinct clay films in pores; common pressure faces; neutral; clear wavy boundary.
BC—24 to 29 inches; dark grayish brown (2.5Y 4/2) gravelly silty clay, grayish brown (2.5Y 5/2) dry; massive; very hard, firm, very sticky and very plastic; common medium and coarse roots; common very fine tubular pores; 25 percent gravel; many pressure faces; neutral; abrupt wavy boundary.
C—29 to 38 inches; olive gray (5Y 4/2) silty clay, light olive gray (5Y 6/2) dry; massive; very hard, firm, sticky and very plastic; few very fine roots; common very fine tubular pores; 10 percent soft gravel; common pressure faces; neutral; abrupt irregular boundary.
Cr—38 inches; weathered serpentinitic rock.

Depth to bedrock is 20 to 40 inches.

The A horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 1 or 2 moist or dry.

The Bt horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 2 to 4 moist and 4 or 5 dry, and chroma of 1 or 2 moist or dry. The horizon is gravelly clay or gravelly silty clay.

The BC and C horizons have hue of 5Y or 2.5Y, value of 4 or 5 moist and 6 or 7 dry, and chroma of 1 or 2 moist or dry.

Pengra Series

The Pengra series consists of very deep, somewhat poorly drained soils on toeslopes, footslopes, and alluvial fans. These soils formed in alluvium and colluvium over residuum derived from siltstone and sandstone. Slopes are 2 to 30 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Pengra silt loam, 2 to 20 percent slopes; 750 feet south and 1,650 feet east of the northwest corner of sec. 15, T. 28 S., R. 5 W.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; many fine distinct yellowish brown (10YR 5/6) mottles; strong very fine and fine granular structure and very fine and fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine and fine tubular pores; moderately acid; clear smooth boundary.
A2—3 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; many fine distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 4/6) mottles; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; many very fine and fine roots; many very fine and fine and few medium tubular pores; few faint coatings of

silt on faces of peds and in pores; moderately acid; clear smooth boundary.

Bw—7 to 16 inches; very dark grayish brown (10YR 3/2) silty clay loam, brown (10YR 5/3) dry; many fine and medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 4/6) mottles; moderately fine, medium, and coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots; many very fine and fine and few medium tubular pores; faint coatings of clean silt and sand grains on faces of peds; strongly acid; abrupt smooth boundary.

2Bt1—16 to 27 inches; dark grayish brown (2.5Y 4/2) clay, grayish brown (2.5Y 5/2) dry; many fine faint yellowish brown (10YR 5/6) mottles; moderate very coarse prismatic structure parting to medium and coarse subangular blocky; extremely hard, extremely firm, very sticky and very plastic; common very fine and fine roots along vertical faces of peds; many very fine tubular pores; common pressure faces; 5 percent soft gravel; strongly acid; clear smooth boundary.

2Bt2—27 to 36 inches; olive gray (5Y 4/2) clay, olive gray (5Y 5/2) dry; many fine faint olive yellow (2.5Y 6/6) mottles; weak coarse and very coarse prismatic structure parting to medium and coarse subangular blocky; extremely hard, extremely firm, very sticky and very plastic; few very fine and fine roots along vertical faces of peds; common very fine and fine tubular pores; common distinct dark olive gray (5Y 3/2) clay films on faces of peds and in pores; many pressure faces; 10 percent soft gravel; strongly acid; clear smooth boundary.

2Bt3—36 to 60 inches; olive gray (5Y 4/2) clay, olive gray (5Y 5/2) dry; many fine faint olive yellow (2.5Y 6/6) mottles; moderate coarse and very coarse prismatic structure parting to medium and coarse angular and subangular blocky; extremely hard, extremely firm, very sticky and very plastic; few very fine and fine roots along vertical faces of peds; common fine and medium tubular pores; many distinct and prominent dark grayish brown (2.5Y 4/2) clay films on faces of peds and in pores; common pressure faces; 10 percent soft gravel; strongly acid.

Depth to bedrock is 60 inches or more. Depth to the 2Bt horizon is 14 to 30 inches. Mottles that are a result of wetness are throughout the profile.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 2 or 3 moist or dry.

The Bw horizon has hue of 5Y, 2.5Y, or 10YR, value of 3 to 5 moist and 4 to 6 dry, and chroma of 2 or 3 moist or dry.

The 2Bt horizon has hue of 5Y, 2.5Y, or 10YR, value of 3 to 5 moist and 4 to 6 dry, and chroma of 1 to 4 moist or dry.

Philomath Series

The Philomath series consists of shallow, well drained soils on footslopes, side slopes, and ridges. These soils formed in colluvium and residuum derived from basalt. Slopes are 3 to 70 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Philomath silty clay in an area of Philomath-Dixonville complex, 3 to 30 percent slopes; 1,720 feet north and 800 feet east of the southwest corner of sec. 19, T. 26 S., R. 5 W.

A1—0 to 4 inches; black (10YR 2/1) silty clay, very dark brown (10YR 2/2) dry; moderate coarse prismatic structure and strong fine and medium subangular blocky; hard, firm, sticky and plastic; many very fine and fine roots; common very fine and fine irregular pores; slightly acid; clear smooth boundary.

A2—4 to 12 inches; black (10YR 2/1) clay, very dark brown (10YR 2/2) dry; moderate coarse prismatic structure and moderate medium and coarse subangular blocky; hard, firm, very sticky and very plastic; many very fine and fine roots; common very fine and fine irregular pores; few fine shot fragments; many pressure faces; neutral; gradual smooth boundary.

A3—12 to 16 inches; black (10YR 2/1) clay, very dark brown (10YR 2/2) dry; moderate fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; many very fine and fine roots; common very fine and fine irregular pores; 10 percent weathered basalt gravel; many pressure faces; neutral; clear wavy boundary.

2Crt—16 inches; weathered basalt; many very dark brown (10YR 2/2) organic stains and reddish brown (5YR 4/4) clay films in fractures; many fine and very fine roots in fractures.

Depth to bedrock is 12 to 20 inches. The profile has cracks that are open for more than 60 consecutive days in summer. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 dry and chroma of 1 or 2 moist or dry. The lower part of the A horizon is clay, cobbly silty clay, or cobbly clay.

Pollard Series

The Pollard series consists of very deep, well drained soils on footslopes, side slopes, and ridges. These soils formed in residuum and colluvium derived from sandstone, siltstone, and metamorphic rock. Slopes are 3 to 60 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Pollard gravelly loam, 3 to 30 percent slopes; 2,050 feet west and 50 feet north of the southeast corner of sec. 29, T. 31 S., R. 7 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 6 inches; dark brown (7.5YR 4/4) gravelly loam, brown (7.5YR 5/4) dry; strong fine granular structure; slightly hard, friable, slightly sticky and plastic; many fine and medium roots and few coarse roots; many fine irregular pores; 20 percent gravel; slightly acid; abrupt smooth boundary.

AB—6 to 16 inches; yellowish red (5YR 4/6) clay loam, reddish brown (5YR 5/4) dry; strong medium subangular blocky structure; slightly hard, friable, sticky and plastic; many fine roots, common medium roots, and few coarse roots; many very fine irregular and tubular pores; 10 percent gravel; moderately acid; clear smooth boundary.

Bt—16 to 35 inches; red (2.5YR 4/6) clay, red (2.5YR 5/6) dry; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; common fine and few medium roots; many very fine tubular pores; common distinct clay films on faces of peds and in pores; 10 percent gravel; few prominent manganese stains; moderately acid; clear smooth boundary.

BCt—35 to 60 inches; red (2.5YR 4/6) clay, red (2.5YR 5/6) dry; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; many very fine tubular pores; few distinct clay films on faces of peds and in pores; 10 percent gravel; few prominent manganese stains; moderately acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 3 or 4 moist and 4 or 5 dry, and chroma of 3 or 4 moist and 3 to 6 dry.

The Bt and BCt horizons have hue of 5YR or 2.5YR, value of 3 or 4 moist and 4 or 5 dry, and chroma of 4 to 6 moist and 5 to 7 dry. They are clay, silty clay, or clay loam.

Preacher Series

The Preacher series consists of very deep, well drained soils on side slopes and ridges. These soils formed in colluvium and residuum derived from sandstone and siltstone. Slopes are 0 to 90 percent. The mean annual precipitation is about 85 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Preacher loam, 0 to 30 percent slopes; 2,510 feet east and 2,380 feet north of the southwest corner of sec. 22, T. 20 S., R. 9 W.

Oi—2 inches to 0; slightly decomposed leaves, stems, cones, and needles.

A1—0 to 4 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; strong fine and medium granular structure; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots; many very fine and fine tubular pores; 10 percent gravel; strongly acid; clear smooth boundary.

A2—4 to 10 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; strong fine and medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots; common very fine and fine tubular pores; 10 percent gravel; strongly acid; clear smooth boundary.

BA—10 to 19 inches; dark brown (7.5YR 3/4) loam, brown (7.5YR 5/4) dry; moderate fine and medium subangular blocky structure; soft, friable, sticky and plastic; common very fine and fine roots; many very fine and fine tubular pores; 10 percent gravel; strongly acid; clear smooth boundary.

Bw1—19 to 34 inches; brown (7.5YR 4/4) loam, light yellowish brown (10YR 6/4) dry; weak medium and coarse subangular blocky structure; soft, friable, sticky and plastic; common very fine and fine roots; common very fine and fine tubular pores; 15 percent soft gravel; strongly acid; clear smooth boundary.

Bw2—34 to 57 inches; brown (7.5YR 4/4) clay loam, light yellowish brown (10YR 6/4) dry; weak medium and coarse subangular blocky structure; soft, firm, sticky and plastic; few very fine and fine roots; many very fine and fine tubular pores; 35 percent soft gravel and cobbles; very strongly acid; clear smooth boundary.

C—57 to 60 inches; brown (7.5YR 4/6) clay loam, light yellowish brown (7.5YR 6/4) dry; massive; soft, firm, sticky and plastic; many very fine and fine tubular pores; 50 percent soft gravel; very strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist and 2 to 4 dry.

The Bw horizon has value of 3 or 4 moist and 3 to 6 dry, and it has chroma of 3 or 4 moist or dry. It is loam or clay loam.

The C horizon has value of 4 or 5 moist and 6 or 7 dry. The horizon is clay loam, loam, or sandy loam and is 10 to 80 percent soft rock fragments.

Pyrady Series

The Pyrady series consists of very deep, moderately well drained soils on ridges. These soils formed in colluvium and residuum derived from metamorphic rock. Slopes are 15 to 30 percent. The mean annual precipitation is about 90 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of Pyrady clay loam in an area of Zalea-Pyrady complex, 15 to 30 percent slopes; 500 feet north and 330 feet east of the southwest corner of sec. 36, T. 37 S., R. 12$^1/_2$ W.

Oi—1 inch to 0; slightly decomposed needles, leaves, twigs, and woody material.

A—0 to 6 inches; dark brown (10YR 3/3) clay loam, yellowish brown (10YR 5/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and few medium roots; many very fine and fine tubular pores; 10 percent gravel and 2 percent cobbles; very strongly acid; clear smooth boundary.

Bt1—6 to 12 inches; dark brown (10YR 4/3) gravelly clay loam, light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; hard, friable, slightly sticky and plastic; common very fine and fine roots and few medium roots; many very fine and fine tubular pores; common distinct clay films on faces of peds and in pores; 15 percent gravel and 5 percent cobbles; very strongly acid; clear smooth boundary.

Bt2—12 to 21 inches; olive brown (2.5Y 4/4) gravelly clay loam, light yellowish brown (2.5Y 6/4) dry; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots and few medium roots; many fine tubular pores; common distinct clay films on faces of peds and in pores; 15 percent gravel and 5 percent cobbles; very strongly acid; clear smooth boundary.

2Bt3—21 to 34 inches; olive (5Y 5/3) gravelly silty clay, pale olive (5Y 6/3) dry; common fine distinct olive yellow (2.5Y 6/6) mottles; strong fine and medium angular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; common fine tubular pores; many distinct clay films on faces of peds and in pores; 15 percent gravel and 5 percent cobbles; very strongly acid; clear wavy boundary.

2Btg—34 to 43 inches; dark gray (5Y 4/1) gravelly silty clay, gray (5Y 6/1) dry; many medium prominent olive yellow (2.5Y 6/6) mottles; strong fine and medium angular blocky structure; hard, firm, very sticky and very plastic; few fine and medium roots; few fine tubular pores; common distinct clay films on faces of peds and in pores; 15 percent gravel and 5 percent cobbles; very strongly acid; clear wavy boundary.

2C—43 to 66 inches; olive gray (5Y 5/2) gravelly clay, light gray (5Y 7/1) dry; many distinct medium olive brown (2.5Y 4/4) mottles and common coarse prominent olive yellow (2.5Y 6/6) mottles; massive; very hard, very firm, very sticky and very plastic; few fine and medium roots; few fine tubular pores; 15 percent gravel, 5 percent cobbles, and 35 percent manganese concretions 2 to 5 millimeters in diameter; very strongly acid.

Depth to bedrock is 60 inches or more. Depth to mottles that are a result of wetness and depth to the 2Bt horizon are 20 to 30 inches.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist and 4 or 5 dry, and chroma of 2 or 3 moist and 4 to 6 dry.

The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 moist and 5 or 6 dry, and chroma of 3 or 4 moist and 4 to 6 dry. The horizon is gravelly clay loam, clay loam, or gravelly clay.

The 2Bt horizon has hue of 2.5Y or 5Y, value of 4 to 6 moist and 6 or 7 dry, and chroma of 1 to 4 moist or dry. The horizon is gravelly silty clay loam, gravelly silty clay, or gravelly clay.

The 2C horizon has value of 5 to 7 moist and 6 or 7 dry, and it has chroma of 1 or 2 moist or dry. It is gravelly clay or gravelly silty clay.

Quosatana Series

The Quosatana series consists of very deep, poorly drained soils in swales on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Quosatana silt loam, 0 to 3 percent slopes; 2,225 feet east and 1,700 feet north of the southwest corner of sec. 6, T. 21 S., R. 10 W.

Oi—0.5 inch to 0; slightly decomposed grasses, sedges, and rushes.

A1—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (2.5Y 5/2) dry; common fine and medium distinct dark brown (7.5YR 3/4) mottles; moderate fine and medium granular and subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many fine irregular pores; strongly acid; gradual smooth boundary.

A2—7 to 16 inches; very dark grayish brown (2.5Y 3/2) silt loam, grayish brown (2.5Y 5/2) dry; common fine and medium distinct dark brown (7.5YR 3/4) and dark reddish brown (5YR 3/4) mottles; moderate fine and medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common fine and medium roots; common fine tubular pores; strongly acid; gradual smooth boundary.

Bg1—16 to 27 inches; dark grayish brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; common fine and medium distinct dark brown (7.5YR 3/4) and dark reddish brown (5YR 3/4) mottles; moderate medium and coarse subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few fine and medium roots; common fine and medium tubular pores; many prominent dark reddish brown (5YR 3/2) manganese stains on faces of peds and in pores; strongly acid; clear smooth boundary.

Bg2—27 to 34 inches; dark grayish brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; common fine and medium distinct dark brown (7.5YR 3/4) and dark reddish brown (5YR 3/4) mottles; weak coarse subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine and medium tubular pores; common fine and medium prominent dark reddish brown (5YR 3/2) manganese stains on faces of peds and in pores; many small pockets of organic matter; strongly acid; clear smooth boundary.

Cg1—34 to 55 inches; dark gray (5Y 4/1) silty clay loam, light brownish gray (2.5Y 6/2) dry; few fine and medium dark brown (7.5YR 3/4) and dark reddish brown (5YR 3/4) mottles; massive; soft, friable, sticky and slightly plastic; common medium and coarse tubular pores; many prominent dark reddish brown (5YR 3/2) manganese stains in pores and old root channels; few pockets of organic matter; very strongly acid; gradual smooth boundary.

Cg2—55 to 63 inches; dark gray (5Y 4/1) silty clay, grayish brown (2.5Y 5/2) dry; massive; soft, friable, sticky and plastic; many pockets of decomposed organic matter; very strongly acid.

Depth to bedrock is 60 inches or more. Mottles that are a result of wetness are throughout the profile.

The A horizon has hue of 2.5Y or 10YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 1 to 3 moist or dry.

The Bg horizon has hue of 5Y, 2.5Y, or 10YR, value of 4 or 5 moist and 5 to 7 dry, and chroma of 1 or 2 moist or dry. The horizon is silt loam or silty clay loam.

The Cg horizon is stratified silty clay, silty clay loam, or loam. Colors are similar to those of the Bg horizon.

The Quosatana soils in this survey area are a taxadjunct to the series because they are classified as acid.

Redbell Series

The Redbell series consists of very deep, somewhat poorly drained soils on terraces and alluvial fans. These soils formed in mixed alluvium. Slopes are 0 to 5 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Redbell silt loam, 0 to 5 percent slopes; 2,000 feet east and 400 feet south of the northwest corner of sec. 32, T. 27 S., R. 7 W.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate very fine and fine subangular blocky structure parting to fine and medium granular; hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; common very fine irregular pores; moderately acid; clear smooth boundary.

A2—3 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate medium and coarse subangular blocky structure parting to fine and medium subangular blocky; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and few medium roots; common very fine and fine tubular pores; common faint very fine coatings of sand and silt on faces of peds and in pores; moderately acid; clear smooth boundary.

Bt1—8 to 18 inches; very dark grayish brown (10YR 3/2) silty clay loam, brown (10YR 5/3) dry; common fine and medium distinct yellowish brown (10YR 5/6) mottles and common fine and medium faint grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) mottles; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots and few medium roots; many very fine and fine and few medium tubular pores; common faint clay films on faces of peds and in pores; common faint organic stains on faces of peds and in pores; moderately acid; gradual smooth boundary.

Bt2—18 to 34 inches; very dark grayish brown (10YR 3/2) silty clay loam, brown (10YR 5/3) dry; common fine and medium distinct yellowish brown (10YR 5/6) mottles and common fine and medium faint grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) mottles; moderate medium and coarse subangular blocky structure; very hard, firm, very sticky and plastic; many very fine and fine roots and few medium roots; many very fine and fine and few medium tubular pores; common distinct clay films on faces of peds and in pores; common distinct organic stains on faces of peds and in pores; moderately acid; gradual smooth boundary.

Bt3—34 to 42 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 5/3) dry; many fine and medium distinct yellowish brown (10YR 5/6) and gray (10YR 6/1) mottles; moderate medium and coarse subangular blocky structure; hard, firm, very sticky and plastic; common very fine and fine roots; many very fine and fine and few medium tubular pores; common distinct very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; 5 percent soft gravel; moderately acid; gradual smooth boundary.

Bt4—42 to 50 inches; mottled, yellowish brown (10YR 5/6), gray (10YR 5/1), and light gray (10YR 6/1) silty clay loam; weak medium and coarse subangular blocky structure; hard, friable, sticky and plastic; few fine and medium roots; many very fine and fine tubular pores; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds and in pores; common manganese shot fragments and prominent manganese stains on faces of peds; 10 percent soft gravel; moderately acid; gradual smooth boundary.

BCt—50 to 62 inches; mottled, strong brown (7.5YR 5/8), grayish brown (10YR 5/2), and light brownish gray (10YR 6/2) loam; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; many very fine and fine tubular pores; few faint clay films on faces of peds and in pores; many distinct very dark gray (10YR 3/1) manganese stains on faces of peds; 10 percent soft gravel; moderately acid; clear smooth boundary.

2C—62 to 70 inches; multicolored extremely gravelly sand; single grain; loose, nonsticky and nonplastic.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR. Mottles that are a result of wetness are within a depth of 30 inches of the surface.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bt horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 2 to 4 moist or dry. It is silty clay loam, gravelly silty clay, or silty clay.

The BCt horizon has colors similar to those of the Bt horizon.

The 2C horizon is sand and is 60 to 80 percent rock fragments. It generally is at depth of more than 60 inches, but in some pedons it is at a depth 45 inches or more.

Reedsport Series

The Reedsport series consists of moderately deep, well drained soils on side slopes and ridges. These soils formed in colluvium derived from sandstone. Slopes are 30 to 90 percent. The mean annual precipitation is about 80 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of Reedsport gravelly loam in an area of Svensen-Millicoma-Reedsport complex, 35 to 75 percent slopes; 2,500 feet west and 1,000 feet south of the northeast corner of sec. 6, T. 22 S., R. 11 W.

A—0 to 5 inches; very dark grayish brown (10YR 3/2) gravelly loam, brown (10YR 5/3) dry; moderate fine and medium granular structure; soft, friable, slightly sticky and slightly plastic; common fine and medium roots and few coarse roots; many very fine and fine irregular pores; 15 percent hard gravel and 5 percent soft gravel; moderately acid; clear smooth boundary.

Bw1—5 to 12 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; moderate fine and medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common fine and medium roots and few coarse roots; many fine and medium tubular pores; 10 percent hard gravel and 20 percent soft cobbles; strongly acid; clear smooth boundary.

Bw2—12 to 25 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common fine and medium roots; common very fine and fine tubular pores; 10 percent hard gravel and 20 percent soft cobbles; strongly acid; clear smooth boundary.

Bw3—25 to 32 inches; dark brown (10YR 3/3) clay loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common fine and medium roots; common very fine and fine tubular pores; 10 percent hard gravel and 20 percent soft cobbles; strongly acid; abrupt smooth boundary.

Cr—32 inches; weathered sandstone.

Depth to bedrock is 20 to 40 inches.

The A horizon has value of 2 or 3 moist and 3 to 5 dry, and it has chroma of 1 to 3 moist or dry.

The Bw horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist and 5 or 6 dry, and chroma of 2 or 3 moist and 3 or 4 dry. The horizon is loam, clay loam, or gravelly loam.

Remote Series

The Remote series consists of very deep, well drained soils on side slopes. These soils formed in colluvium derived from metamorphic rock. Slopes are 60 to 90 percent. The mean annual precipitation is about 65 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Remote very gravelly loam in an area of Remote-Digger complex, 60 to 90 percent slopes; 800 feet north and 400 feet east of the southwest corner of sec. 4, T. 32 S., R. 9 W.

Oi—2 inches to 0; slightly decomposed needles and twigs.

A—0 to 10 inches; dark brown (10YR 3/3) very gravelly loam, pale brown (10YR 6/3) dry; moderate very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots, common medium roots, and few coarse roots; many very fine irregular pores; 55 percent gravel; strongly acid; clear smooth boundary.

Bw1—10 to 26 inches; dark yellowish brown (10YR 4/4) very gravelly loam, light yellowish brown (10YR 6/4) dry; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and slightly plastic; many very fine roots and common fine, medium, and coarse roots; many very fine tubular pores; 55 percent gravel; very strongly acid; gradual wavy boundary.

Bw2—26 to 41 inches; yellowish brown (10YR 5/6) extremely gravelly loam, yellow (10YR 7/6) dry; weak fine and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots and few medium and coarse roots; many very fine tubular pores; 60 percent gravel; very strongly acid; gradual smooth boundary.

Bw3—41 to 60 inches; dark yellowish brown (10YR 4/4) extremely gravelly loam, light yellowish brown (10YR 6/4) dry; weak fine and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine and fine roots; common very fine tubular pores; 65 percent gravel and 5 percent cobbles; strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has value of 3 or 4 moist and 6 or 7 dry, and it has chroma of 2 or 3 moist or dry. It is 35 to 60 percent rock fragments.

The Bw horizon has hue of 10YR or 7.5YR, value or 4 or 5 moist and 6 or 7 dry, and chroma of 3 to 6 moist or dry. The horizon is very gravelly loam, very gravelly clay loam, or extremely gravelly loam and is 35 to 70 percent rock fragments.

Reston Series

The Reston series consists of very shallow, well drained soils on ridges and side slopes. These soils formed in colluvium and residuum derived from metamorphic rock. Slopes are 3 to 75 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of Reston loam in an area of McMullin-Reston complex, 3 to 30 percent slopes; 300 feet north and 300 feet west of the southeast corner of sec. 16, T. 28 S., R. 5 W.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate very fine and fine granular structure and moderate very fine and fine subangular blocky; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine irregular pores; 5 percent soft greenstone gravel; strongly acid; clear smooth boundary.

Bt—2 to 7 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine irregular and tubular pores; common faint very dark grayish brown (10YR 3/2) clay films on lfaces of peds and in pores; 10 percent soft greenstone gravel; strongly acid; abrupt wavy boundary.

R—7 inches; greenstone; few fine roots in fractures.

Depth to bedrock is 5 to 10 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bt horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 to 4 moist or dry. It is loam or gravelly loam.

Ritner Series

The Ritner series consists of moderately deep, well drained soils on footslopes, side slopes, and ridges. These soils formed in colluvium derived from basalt. Slopes are 12 to 90 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Ritner gravelly silty clay loam, 30 to 60 percent north slopes; 2,130 feet east and 1,000 feet north of the southwest corner of sec. 23, T. 25 S., R. 4 W.

A1—0 to 4 inches; dark reddish brown (5YR 3/2) gravelly silty clay loam, dark brown (7.5YR 4/2) dry; moderate very fine and fine granular structure; hard, firm, sticky and plastic; many very fine and fine roots; many very fine irregular pores; many distinct organic coatings; 30 percent fine gravel; moderately acid; clear smooth boundary.

A2—4 to 9 inches; dark reddish brown (5YR 3/3) gravelly silty clay loam, dark brown (7.5YR 4/4) dry; moderate very fine and fine granular structure and very fine subangular blocky; hard, firm, sticky and plastic; many very fine and fine roots and common medium roots; many very fine and fine irregular pores; many faint organic coatings; 25 percent gravel and 5 percent cobbles; moderately acid; clear smooth boundary.

Bt—9 to 23 inches; dark reddish brown (5YR 3/4) very gravelly silty clay, dark brown (7.5YR 4/4) dry; moderate medium and coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; common fine and medium roots; common very fine and fine tubular pores; few faint clay films on rock fragments and in pores; 40 percent gravel and 20 percent cobbles; moderately acid; clear smooth boundary.

BCt—23 to 34 inches; dark reddish brown (5YR 3/4) very cobbly silty clay, dark brown (7.5YR 4/4) dry; moderate medium and coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; common fine and medium roots; common very fine and fine tubular pores; common distinct clay films on rock fragments and few faint clay films on faces of peds and in pores; 30 percent gravel and 30 percent cobbles; moderately acid; abrupt wavy boundary.

R—34 inches; basalt; few roots in fractures.

Depth to bedrock is 20 to 40 inches.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 2 or 3 moist and 3 or 4 dry, and chroma of 2 to 4 moist or dry.

The Bt and BCt horizons have hue of 7.5YR, 5YR, or 2.5YR, value of 3 or 4 moist and 4 or 5 dry, and chroma of 4 to 6 moist or dry. The horizons are very gravelly silty clay, very cobbly silty clay, very cobbly silty clay loam, or extremely cobbly silty clay loam and are 35 to 70 percent rock fragments.

Romanose Series

The Romanose series consists of shallow, well drained soils on side slopes. These soils formed in colluvium derived from basalt. Slopes are 60 to 90 percent. The mean annual precipitation is about 105 inches, and the mean annual air temperature is about 44 degrees F.

Typical pedon of Romanose very gravelly sandy loam in an area of Romanose-Laderly complex, 60 to 90 percent south slopes; 400 feet north and 400 feet east of the southwest corner of sec. 13, T. 19 S., R. 9 W.

Oi—3 inches to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 4 inches; very dark brown (10YR 2/2) very gravelly sandy loam, dark brown (10YR 3/3) dry; strong very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and medium roots and common coarse roots; many very fine and fine irregular pores; 40 percent gravel and 10 percent cobbles; strongly acid; clear smooth boundary.

AC—4 to 12 inches; dark brown (7.5YR 3/2) very gravelly sandy loam, brown (7.5YR 4/3) dry; weak very fine and fine granular structure; soft, very friable, slightly sticky and nonplastic; many very fine, fine, and medium roots and common coarse roots; many very fine and fine irregular pores; 40 percent gravel and 15 percent cobbles; strongly acid; clear smooth boundary.

C—12 to 18 inches; dark yellowish brown (10YR 4/4) extremely cobbly sandy loam, yellowish brown (10YR 5/4) dry; massive; soft, very friable, slightly sticky and nonplastic; common fine and medium roots; many very fine, fine, and medium irregular pores; 25 percent gravel and 50 percent cobbles; very strongly acid; abrupt smooth boundary.

R—18 inches; sandstone overlying basalt.

Depth to bedrock is 10 to 20 inches. Moist bulk density is less than 1.00 gram per cubic centimeter. The profile has hue of 10YR or 7.5YR.

The A and AC horizons have value of 2 or 3 moist and 3 or 4 dry, and they have chroma of 2 or 3 moist and dry. They are 35 to 60 percent rock fragments.

The C horizon has value of 3 or 4 moist and 4 or 5 dry, and it has chroma of 4 or 5 moist or dry. It is very cobbly sandy loam or extremely cobbly sandy loam. It is 35 to 80 percent rock fragments.

Roseburg Series

The Roseburg series consists of very deep, well drained soils on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Roseburg loam, 0 to 3 percent slopes; 1,050 feet south and 1,100 feet east of the northwest corner of sec. 32, T. 26 S., R. 6 W.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak fine granular structure and weak fine subangular blocky; hard, friable, slightly sticky and slightly plastic; many fine roots; many fine irregular pores; moderately acid; abrupt smooth boundary.

A2—4 to 10 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; moderately acid; abrupt smooth boundary.

BAt—10 to 15 inches; very dark grayish brown (10YR 3/2) clay loam, grayish brown (10YR 5/2) dry; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; many very fine and common fine and medium tubular pores; few faint very dark brown (10YR 2/2) clay films on vertical faces of peds and in pores; moderately acid; clear smooth boundary.

Bt1—15 to 32 inches; dark brown (7.5YR 3/2) clay loam, brown (7.5YR 5/2) dry; weak medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; few fine roots; many very fine and common fine and medium tubular pores; common distinct very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; slightly acid; clear smooth boundary.

Bt2—32 to 41 inches; dark brown (7.5YR 3/4) loam, brown (7.5YR 5/4) dry; weak fine prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, sticky and plastic; few fine roots; many very fine and common fine and medium tubular pores; common distinct very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; slightly acid; clear smooth boundary.

BCt—41 to 50 inches; dark brown (7.5YR 3/4) sandy loam, brown (7.5YR 5/4) dry; weak medium subangular blocky structure; hard, friable, sticky and slightly plastic; few fine roots; many very fine and few fine and medium tubular pores; common distinct very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; slightly acid; gradual wavy boundary.

C—50 to 64 inches; dark brown (7.5YR 3/4) sandy loam, brown (7.5YR 5/4) dry; massive; soft, very friable, nonsticky and nonplastic; slightly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bt horizon has value of 2 or 3 moist to a depth of 20 inches and 3 or 4 moist below a depth of 20 inches, and it has value of 4 or 5 dry. The horizon has chroma of 2 to 4 moist or dry. It is loam, clay loam, or sandy clay loam.

The lower part of the solum and the C horizon are stratified in some pedons.

Rosehaven Series

The Rosehaven series consists of very deep, well drained soils on toeslopes, footslopes, side slopes, and ridges. These soils formed in colluvium and residuum derived from sandstone and siltstone. Slopes are 3 to 60 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Rosehaven loam, 12 to 30 percent slopes; 2,850 feet west and 400 feet north of the southeast corner of sec. 29, T. 25 S., R. 5 W.

A1—0 to 6 inches; dark brown (10YR 4/3) loam, very pale brown (10YR 7/3) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and few coarse roots; many very fine and fine irregular and tubular pores; neutral; clear smooth boundary.

A2—6 to 12 inches; dark brown (10YR 4/3) loam, very pale brown (10YR 7/3) dry; moderate fine and medium subangular blocky structure and weak medium platy structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine and fine tubular pores; slightly acid; gradual smooth boundary.

Bt1—12 to 25 inches; dark yellowish brown (10YR 4/4) clay loam, very pale brown (10YR 7/4) dry; moderate medium and coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common fine and medium roots; common fine and medium irregular and tubular pores; few faint clay films in pores; common distinct coatings of white (10YR 8/2) clean very fine sand grains on faces of peds; slightly acid; gradual smooth boundary.

Bt2—25 to 45 inches; yellowish brown (10YR 5/6) clay loam, light yellowish brown (10YR 6/4) dry; moderate medium and coarse subangular blocky structure; hard, firm, sticky and slightly plastic; common fine and medium roots; common fine irregular pores; common distinct yellowish red (5YR 5/6) clay films on faces of peds and in pores; common distinct coatings of white (10YR 8/2) clean very fine sand grains on faces of peds; moderately acid; clear smooth boundary.

Bt3—45 to 63 inches; yellowish brown (10YR 5/6) clay loam, pale brown (10YR 6/3) dry; weak medium and coarse subangular blocky structure; very hard, very firm, sticky and plastic; few fine roots; many very fine tubular pores; many distinct yellowish red (5YR 5/6) clay films on faces of peds and in pores; many faint colloidal stains on mineral sand grains; 5 percent fine gravel; moderately acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 4 or 5 moist and 5 to 7 dry, and it has chroma of 3 to 6 moist or dry.

The Bt horizon has value of 4 or 5 moist and 6 or 7 dry, and it has chroma of 3 to 6 moist or dry. It is clay loam or sandy clay loam.

Sahaptin Series

The Sahaptin series consists of shallow, well drained soils on side slopes. These soils formed in colluvium derived from basalt. Slopes are 30 to 90 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Sahaptin very cobbly silty clay loam in an area of Ritner-Sahaptin complex, 30 to 60 percent south slopes; 2,000 feet east and 1,980 feet north of the southwest corner of sec. 35, T. 25 S., R. 4 W.

A1—0 to 3 inches; very dark brown (10YR 2/2) very cobbly silty clay loam, dark brown (10YR 4/3) dry; strong very fine and fine granular structure; hard, firm, sticky and plastic; many very fine and fine roots and common medium roots; many very fine irregular pores; many organic coatings; 25 percent gravel and 15 percent cobbles; moderately acid; clear smooth boundary.

A2—3 to 8 inches; very dark brown (10YR 2/2) very cobbly silty clay loam, dark brown (10YR 4/3) dry; moderate very fine and fine granular structure and very fine subangular blocky; hard, firm, sticky and very plastic; many very fine and fine roots and common medium roots; common very fine continuous tubular pores; many organic coatings; 30 percent gravel and 20 percent cobbles; moderately acid; clear smooth boundary.

Bw—8 to 17 inches; dark brown (10YR 3/3) extremely cobbly silty clay, dark brown (10YR 4/3) dry; moderate very fine and fine subangular blocky structure; very hard, very firm, sticky and very plastic; many very fine and fine roots; common very fine continuous tubular pores; common organic coatings; 45 percent gravel and 35 percent cobbles; moderately acid; clear smooth boundary.

R—17 inches; basalt.

Depth to bedrock is 10 to 20 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist and 2 to 4 dry. It is 35 to 60 percent rock fragments.

The Bw horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry. It is extremely cobbly silty clay, very cobbly silty clay loam, or very gravelly silty clay and is 45 to 85 percent rock fragments.

Salander Series

The Salander series consists of very deep, well drained soils on side slopes and ridges. These soils formed in colluvium and residuum derived from sandstone and siltstone. Slopes are 12 to 70 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Salander silt loam, 12 to 30 percent slopes; 1,980 feet south and 1,760 feet east of the northwest corner of sec. 30, T. 22 S., R. 12 W.

Oi—3 inches to 0; slightly decomposed leaves, twigs, and needles.

A1—0 to 6 inches; very dark brown (10YR 2/2) silt loam, brown (10YR 4/3) dry; strong fine and medium granular structure; soft, very friable, slightly sticky and nonplastic; many very fine and fine roots and common medium roots; common very fine and fine irregular and tubular pores; strongly acid; clear smooth boundary.

A2—6 to 17 inches; dark reddish brown (5YR 3/2) silt loam, dark brown (7.5YR 4/3) dry; moderate fine and medium granular structure and very fine and fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine and fine irregular and tubular pores; 5 percent fine shot fragments; strongly acid; gradual smooth boundary.

BA—17 to 28 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/4) dry; moderate medium and coarse subangular blocky structure parting to fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine and medium roots; many very fine and fine tubular pores; 5 percent fine shot fragments; strongly acid; clear smooth boundary.

Bt1—28 to 40 inches; dark brown (7.5YR 4/4) silt loam, brown (7.5YR 5/4) dry; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and medium roots; many very fine and fine tubular pores; few faint clay films and coatings of silt on faces of peds and in pores; very strongly acid; gradual smooth boundary.

Bt2—40 to 53 inches; dark brown (7.5YR 4/4) silt loam, brown (7.5YR 5/4) dry; weak medium and coarse subangular blocky structure; slightly hard, friable, sticky and slightly plastic; few fine roots; many very fine and fine tubular pores; few faint clay films and coatings of silt on faces of peds and in pores; very strongly acid; gradual smooth boundary.

Bt3—53 to 61 inches; dark brown (7.5YR 4/4) silty clay loam, brown (7.5YR 5/4) dry; weak medium and coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few fine roots; many very fine and fine tubular pores; common faint clay films and coatings of silt on faces of peds and in pores; very strongly acid.

Depth to bedrock is 60 inches or more. Moist bulk density is less than 1.00 gram per cubic centimeter.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 1 or 2 moist and 2 or 3 dry.

The BA and Bt horizons have hue of 7.5YR or 5YR, value of 2 to 4 moist and 4 or 5 dry, and chroma of 3 or 4 moist or dry. Value of 4 moist and chroma of 4 are below a depth of 20 inches. The horizon is silt loam, loam, or silty clay loam.

Scaredman Series

The Scaredman series consists of moderately deep, well drained soils on side slopes. These soils formed in colluvium and residuum derived from volcanic rock. Slopes are 30 to 90 percent. The mean annual precipitation is about 70 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of Scaredman extremely gravelly loam in an area of Illahee-Scaredman complex, 60 to 90 percent north slopes; 1,680 feet west and 1,995 feet south of the northeast corner of sec. 33, T. 23 S., R. 2 W.

Oi—1.5 inches to 0; slightly decomposed needles, twigs, and leaves.

A—0 to 10 inches; very dark grayish brown (10YR 3/2) extremely gravelly loam, brown (10YR 5/3) dry; weak fine granular structure; slightly hard, very friable, nonsticky and slightly plastic; many very fine, fine, and medium roots and common coarse roots; common very fine irregular pores; 55 percent gravel and 10 percent cobbles; strongly acid; clear smooth boundary.

Bw1—10 to 17 inches; dark brown (10YR 3/3) very gravelly loam, brown (10YR 5/3) dry; weak very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots and common coarse roots; common fine irregular pores; 45 percent gravel and 5 percent cobbles; strongly acid; clear wavy boundary.

Bw2—17 to 29 inches; dark yellowish brown (10YR 3/4) very gravelly loam, yellowish brown (10YR 5/4) dry; weak very fine subangular blocky structure; slightly hard, friable, sticky and slightly plastic; many very fine, fine, and medium roots and common coarse roots; common fine irregular pores; 40 percent gravel and 15 percent cobbles; very strongly acid; abrupt smooth boundary.

R—29 inches; igneous rock.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry. It is 60 to 75 percent rock fragments.

The Bw horizon has value of 3 or 4 moist and 5 to 7 dry, and it has chroma of 2 to 4 moist or dry. The horizon is very gravelly loam or very cobbly loam and is 35 to 60 percent rock fragments.

Sharpshooter Series

The Sharpshooter series consists of deep, well drained soils on side slopes and ridges. These soils formed in colluvium and residuum derived from mica schist. Slopes are 3 to 90 percent. The mean annual precipitation is about 50 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Sharpshooter loam, 30 to 60 percent south slopes; 945 feet west and 1,155 feet south of the northeast corner of sec. 29, T. 30 S., R. 2 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 5 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; few very fine tubular and irregular pores; 10 percent gravel; moderately acid; clear smooth boundary.

AB—5 to 10 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; few very fine tubular and irregular pores; 10 percent gravel; moderately acid; clear smooth boundary.

Bw1—10 to 19 inches; dark brown (10YR 4/3) loam, yellowish brown (10YR 5/4) dry; weak coarse subangular blocky structure parting to weak fine and medium subangular blocky; slightly hard, friable, sticky and slightly plastic; common very fine, fine, medium, and coarse roots; common very fine and fine tubular and irregular pores; 10 percent gravel; very strongly acid; clear wavy boundary.

Bw2—19 to 31 inches; dark yellowish brown (10YR 4/4) loam, yellowish brown (10YR 5/4) dry; weak medium and coarse subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common very fine, fine, medium, and coarse roots; common very fine and fine tubular and irregular pores; 10 percent gravel; strongly acid; clear wavy boundary.

Bw3—31 to 45 inches; dark yellowish brown (10YR 3/4) gravelly loam, yellowish brown (10YR 5/4) dry; weak medium and coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine, fine, and medium roots; common very fine and fine tubular and irregular pores; 30 percent gravel; strongly acid; clear wavy boundary.

Cr—45 inches; weathered quartz mica schist.

Depth to bedrock is 40 to 60 inches.

The A and AB horizons have chroma of 2 or 3 moist or dry.

The upper part of the Bw horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 3 to 5 moist and 5 to 7 dry, and chroma of 2 to 4 moist or dry. The upper part is loam, clay loam, or gravelly loam.

The lower part of the Bw horizon and the BC horizon, where present, have hue of 2.5Y, 10YR, or 7.5YR, value of 3 to 6 moist and 5 or 6 dry, and chroma of 2 to 4 moist and 3 to 6 dry. The horizons are gravelly clay loam, gravelly loam, or very gravelly clay loam and are 20 to 50 percent rock fragments.

Shivigny Series

The Shivigny series consists of very deep, well drained soils on slumps and side slopes. These soils formed in colluvium derived from volcanic rock. Slopes are 3 to 90 percent. The mean annual precipitation is about 65 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Shivigny very gravelly loam in an area of Honeygrove-Shivigny complex, 3 to 30 percent slopes; 925 feet east and 50 feet north of the southwest corner of sec. 19, T. 27 S., R. 2 W.

A—0 to 5 inches; dark reddish brown (5YR 3/4) very gravelly loam, reddish brown (5YR 5/4) dry; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; 50 percent gravel and 5 percent cobbles; moderately acid; clear wavy boundary.

AB—5 to 10 inches; dark reddish brown (5YR 3/4) very gravelly loam, light reddish brown (5YR 6/4) dry; strong medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine tubular pores; 35 percent gravel; moderately acid; irregular wavy boundary.

BA—10 to 21 inches; yellowish red (5YR 4/6) very stony clay loam, reddish yellow (5YR 6/6) dry; moderate medium subangular blocky structure parting to strong medium granular; hard, friable, sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine tubular pores and many fine and medium irregular pores; 25 percent stones, 15 percent cobbles, and 10 percent gravel; strongly acid; clear wavy boundary.

Bt1—21 to 33 inches; yellowish red (5YR 4/6) very stony clay, strong brown (7.5YR 5/6) dry; strong medium angular and subangular blocky structure;

very hard, firm, very sticky and very plastic; few very fine, fine, medium, and coarse roots; common very fine tubular pores and many fine and medium irregular pores; few distinct clay films on faces of peds and in pores; 30 percent stones, 20 percent cobbles, and 5 percent gravel; very strongly acid; gradual irregular boundary.

Bt2—33 to 47 inches; yellowish red (5YR 4/8) very stony clay, strong brown (7.5YR 5/6) dry; strong medium angular and subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine, fine, and medium roots; few very fine tubular pores and common fine and medium irregular pores; many distinct clay films on faces of peds and in pores; 25 percent stones, 15 percent cobbles, and 10 percent gravel; very strongly acid; gradual irregular boundary.

BCt—47 to 64 inches; mixed yellowish red (5YR 4/8) and reddish brown (5YR 4/4) very stony clay, strong brown (7.5YR 5/6) dry; weak medium subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; many distinct clay films on faces of peds and in pores; common distinct black coatings on faces of peds; 30 percent stones, 15 percent cobbles, and 10 percent gravel; very strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 7.5YR or 5YR, value of 3 or 4 moist and 5 or 6 dry, and chroma of 3 or 4 moist or dry. The horizon is 35 to 60 percent rock fragments.

The Bt and BCt horizons have hue of 7.5YR, 5YR, or 2.5YR, value of 3 or 4 moist and 5 or 6 dry, and chroma of 6 to 8 moist and 4 to 6 dry. The horizons are very stony clay, very stony silty clay, or very stony clay loam and are 35 to 60 percent rock fragments.

Sibold Series

The Sibold series consists of very deep, somewhat poorly drained soils on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 5 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Sibold fine sandy loam, 0 to 5 percent slopes; 2,100 feet west and 500 feet south of the northeast corner of sec. 3, T. 28 S., R. 7 W.

A1—0 to 6 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; many fine distinct strong brown (7.5YR 5/8) mottles; moderate fine and medium subangular blocky structure parting to moderate very fine and fine granular; slightly hard, friable, slightly sticky and nonplastic; many very fine and fine roots; many very fine and fine discontinuous tubular pores; strongly acid; clear smooth boundary.

A2—6 to 12 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; many fine and medium distinct strong brown (7.5YR 5/8) mottles; moderate medium and coarse subangular blocky structure parting to fine and medium subangular blocky; hard, firm, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine and few medium continuous tubular pores; strongly acid; gradual smooth boundary.

Bw—12 to 19 inches; dark yellowish brown (10YR 4/4) loam, light yellowish brown (10YR 6/4) dry; many fine and medium distinct strong brown (7.5YR 5/8) and light brownish gray (10YR 6/2) mottles; few fine and medium very dark gray (10YR 3/1) manganese stains; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine and few medium continuous tubular pores; strongly acid; gradual smooth boundary.

Bt1—19 to 40 inches; dark yellowish brown (10YR 4/4) loam, light yellowish brown (10YR 6/4) dry; many fine and medium distinct strong brown (7.5YR 5/8) and light brownish gray (10YR 6/2) mottles; few fine and medium very dark gray (10YR 3/1) manganese stains; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, firm, slightly sticky and slightly plastic; few very fine roots; many very fine, fine, and medium continuous tubular pores; many distinct and few prominent dark brown (7.5YR 4/4) clay films on faces of peds, lining pores, and bridging sand grains; strongly acid; clear smooth boundary.

Bt2—40 to 49 inches; yellowish brown (10YR 5/6) loam, light yellowish brown (10YR 6/4) dry; many fine and medium distinct strong brown (7.5YR 5/8) and light brownish gray (10YR 6/2) mottles; few fine and medium very dark gray (10YR 3/1) manganese stains; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine and few medium continuous tubular pores; common distinct and few prominent dark brown (7.5YR 4/4) clay films on faces of peds, lining pores, and bridging sand grains; strongly acid; gradual smooth boundary.

2Bt3—49 to 63 inches; brownish yellow (10YR 6/6) silty clay, yellow (10YR 7/6) dry; many medium distinct strong brown (7.5YR 5/8) and light brownish gray (10YR 6/2) mottles; common fine very dark gray (10YR 3/1) manganese stains; weak coarse and very coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; many fine, medium, and coarse continuous tubular pores; common prominent dark yellowish brown (10YR 4/6) clay films lining pores and common faint yellowish brown (10YR 4/6) clay films on faces of peds; strongly acid.

Depth to bedrock is 60 inches or more. Mottles that are a result of wetness are throughout the profile. Depth to the 2Bt horizon is 40 to 60 inches or more.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 3 moist and 3 or 4 dry.

The Bt horizon has value of 4 or 5 moist and 5 or 6 dry, and it has chroma of 3 to 6 moist or dry. It is loam or clay loam.

The 2Bt3 horizon, where present, has hue of 10YR or 2.5Y, value of 5 to 7 moist and 6 or 7 dry, and chroma of 5 to 7 moist or dry. The is silty clay or clay.

Siskiyou Series

The Siskiyou series consists of moderately deep, somewhat excessively drained soils on side slopes. These soils formed in colluvium derived from granodiorite. Slopes are 60 to 90 percent. The mean annual air temperature is about 35 inches, and the mean annual precipitation is about 51 degrees F.

Typical pedon of Siskiyou sandy loam in an area of Tethrick-Siskiyou complex, 60 to 90 percent north slopes; 1,000 feet west and 2,400 feet south of the northeast corner of sec. 30, T. 29 S., R. 4 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 4 inches; dark brown (10YR 3/3) sandy loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; slightly hard, friable, nonsticky and nonplastic; many very fine and common fine roots; many very fine irregular pores; 10 percent gravel; moderately acid; clear smooth boundary.

Bw1—4 to 13 inches; brown (10YR 4/3) sandy loam, brown (10YR 5/3) dry; moderate fine and medium subangular blocky structure; hard, friable, nonsticky and nonplastic; common very fine, fine, and medium roots; common very fine tubular pores; 5 percent gravel; moderately acid; clear smooth boundary.

Bw2—13 to 28 inches; dark yellowish brown (10YR 4/4) sandy loam, yellowish brown (10YR 5/4) dry; weak fine and medium subangular blocky structure; hard, friable, nonsticky and nonplastic; few very fine, fine, and medium roots; common very fine tubular pores; 5 percent gravel; moderately acid; clear smooth boundary.

BC—28 to 32 inches; dark brown (7.5YR 4/4) sandy loam, brown (7.5YR 5/4) dry; weak medium subangular blocky structure; hard, friable, nonsticky and nonplastic; few very fine, fine, and medium roots; common very fine tubular pores; 10 percent gravel; moderately acid; gradual wavy boundary.

Cr—32 inches; weathered granodiorite.

Depth to bedrock is 20 to 40 inches.

The A horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 2 or 3 moist or dry.

The Bw horizon has hue of 2.5Y, 7.5YR, or 10YR, value of 4 or 5 moist and 5 to 7 dry, and chroma of 2 to 4 moist or dry. The horizon is sandy loam, gravelly sandy loam, or gravelly coarse sandy loam.

Sitkum Series

The Sitkum series consists of moderately deep, somewhat excessively drained soils on side slopes. These soils formed in colluvium derived from granodiorite. Slopes are 60 to 90 percent. The mean annual precipitation is about 50 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Sitkum sandy loam in an area of Steinmetz-Sitkum complex, 60 to 90 percent north slopes; 850 feet north and 600 feet west of the southeast corner of sec. 25, T. 28 S, R. 4 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A1—0 to 4 inches; dark brown (7.5YR 3/3) sandy loam, yellowish brown (10YR 5/4) dry; moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots, common fine and medium roots, and few coarse roots; many very fine irregular pores; 5 percent gravel; neutral; clear smooth boundary.

A2—4 to 12 inches; strong brown (7.5YR 4/6) sandy loam, brown (7.5YR 5/4) dry; moderate very fine and fine granular structure; slightly hard, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots and few coarse roots; many very fine irregular pores; 5 percent gravel; neutral; clear wavy boundary.

Bw1—12 to 24 inches; strong brown (7.5YR 4/6) sandy loam, light brown (7.5YR 6/4) dry; weak fine and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic;

common very fine roots and few fine, medium, and coarse roots; common very fine tubular pores; 10 percent gravel; slightly acid; gradual wavy boundary.

Bw2—24 to 38 inches; strong brown (7.5YR 4/6) sandy loam, light brown (7.5YR 6/4) dry; weak medium and coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine, fine, medium, and coarse roots; common very fine tubular pores; 10 percent gravel; moderately acid; clear wavy boundary.

Cr—38 inches; weathered granodiorite.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 3 or 4 moist and 5 or 6 dry, and it has chroma of 3 to 6 moist or dry.

The Bw horizon has value of 4 or 5 moist and 6 or 7 dry, and it has chroma of 4 to 6 moist or dry. It is sandy loam, loam, or gravelly sandy loam.

Speaker Series

The Speaker series consists of moderately deep, well drained soils on footslopes, side slopes, and ridges. These soils formed in colluvium and residuum derived from sandstone, siltstone, and metamorphic rock. Slopes are 2 to 75 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of Speaker loam, 2 to 20 percent slopes; 660 feet north and 350 feet west of the southeast corner of sec. 25, T. 26 S., R. 7 W.

A1—0 to 3 inches; dark brown (7.5YR 4/4) loam, strong brown (7.5YR 5/6) dry; moderate very fine and fine granular structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine and fine irregular pores; moderately acid; gradual smooth boundary.

A2—3 to 10 inches; dark brown (7.5YR 4/4) loam, strong brown (7.5YR 5/6) dry; weak fine and medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine tubular pores; moderately acid; clear smooth boundary.

BAt—10 to 15 inches; dark brown (7.5YR 4/4) loam, strong brown (7.5YR 5/6) dry; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots; many very fine irregular and tubular pores; common faint dark brown (7.5YR 4/4) clay films on faces of peds and in pores; common distinct very fine coatings of sand in root channels and pores; few fine shot fragments; moderately acid; gradual smooth boundary.

Bt—15 to 25 inches; dark brown (7.5YR 4/4) loam, strong brown (7.5YR 5/6) dry; weak medium and coarse subangular blocky structure; extremely hard, friable, sticky and slightly plastic; few fine and medium roots; common fine and medium irregular and tubular pores; common distinct yellowish red (5YR 4/6) clay films on faces of peds and in pores; 10 percent gravel; few prominent black (10YR 2/1) manganese stains; moderately acid; clear smooth boundary.

BCt—25 to 31 inches; strong brown (7.5YR 5/6) gravelly clay loam, strong brown (7.5YR 5/6) dry; weak medium and coarse subangular blocky structure; extremely hard, firm, slightly sticky and slightly plastic; few fine and medium roots; common fine and medium irregular and tubular pores; common distinct yellowish red (5YR 4/6) clay films on faces of peds and in pores; 20 percent gravel; moderately acid; clear smooth boundary.

Cr—31 inches; weathered sandstone; few very fine roots penetrating sandstone material; coatings of clean sand and silt on faces of fractures.

Depth to bedrock is 20 to 40 inches.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist and 4 to 6 dry, and chroma of 3 to 6 moist or dry.

The Bt horizon has hue of 7.5YR or 5YR, value of 4 or 5 moist and 4 to 7 dry, and chroma of 4 to 6 moist or dry. The horizon is clay loam, loam, or gravelly clay loam.

Stackyards Series

The Stackyards series consists of deep, well drained soils on side slopes. These soils formed in colluvium derived from metamorphic rock. Slopes are 60 to 90 percent. The mean annual precipitation is about 90 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of Stackyards extremely gravelly loam, 60 to 90 percent north slopes; 1,650 feet north and 1,650 feet west of the southeast corner of sec. 2, T. 37 S., R. 13 W.

Oi—2 inches to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 10 inches; very dark grayish brown (10YR 3/2) extremely gravelly loam, grayish brown (10YR 5/2) dry; moderate very fine and fine subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and few medium and coarse roots; common very fine irregular pores; 50 percent gravel and 15 percent cobbles; strongly acid; clear wavy boundary.

Bw1—10 to 15 inches; dark brown (10YR 3/3) extremely cobbly clay loam, pale brown (10YR 6/3) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots and few coarse roots; many very fine tubular pores; 40 percent gravel and 25 percent cobbles; strongly acid; clear wavy boundary.

Bw2—15 to 23 inches; dark yellowish brown (10YR 3/4) extremely cobbly loam, pale brown (10YR 6/3) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots and few coarse roots; many very fine tubular pores; 25 percent gravel and 40 percent cobbles; moderately acid; clear wavy boundary.

Bw3—23 to 44 inches; dark yellowish brown (10YR 3/4) extremely cobbly clay loam, pale brown (10YR 6/3) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and coarse roots; many very fine tubular pores; 25 percent gravel and 40 percent cobbles; moderately acid; abrupt wavy boundary.

R—44 inches; metamorphic rock.

Depth to bedrock is 40 to 60 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry. It is 60 to 75 percent rock fragments.

The Bw horizon has value of 3 to 5 moist and 5 to 7 dry, and it has chroma of 3 or 4 moist or dry. It is extremely cobbly loam, extremely cobbly clay loam, or extremely gravelly clay loam and is 60 to 75 percent rock fragments.

Steinmetz Series

The Steinmetz series consists of very deep, somewhat excessively drained soils on side slopes. These soils formed in colluvium derived from granodiorite. Slopes are 60 to 90 percent. The mean annual precipitation is about 50 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Steinmetz gravelly sandy loam in an area of Steinmetz-Sitkum complex, 60 to 90 percent north slopes; 1,650 feet east and 850 feet north of the southwest corner of sec. 21, T. 28 S., R. 3 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A1—0 to 5 inches; dark brown (7.5YR 3/3) gravelly sandy loam, brown (10YR 5/3) dry; moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots and common fine, medium, and coarse roots; many very fine irregular pores; 15 percent gravel; slightly acid; abrupt smooth boundary.

A2—5 to 15 inches; dark brown (7.5YR 3/4) sandy loam, yellowish brown (10YR 5/4) dry; moderate very fine and fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots and few coarse roots; many very fine tubular pores; 10 percent gravel; slightly acid; clear wavy boundary.

Bw1—15 to 30 inches; strong brown (7.5YR 4/6) sandy loam, light yellowish brown (10YR 6/4) dry; weak fine and medium subangular blocky structure; firm, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots and few coarse roots; many very fine tubular pores; 10 percent gravel; moderately acid; gradual wavy boundary.

Bw2—30 to 60 inches; strong brown (7.5YR 4/6) sandy loam, light yellowish brown (10YR 6/4) dry; weak medium and coarse subangular blocky structure; firm, friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common very fine tubular pores; 10 percent gravel; strongly acid.

Depth to bedrock 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 to 4 moist and 4 to 6 dry, and it has chroma of 2 to 4 moist or dry. The upper part of the horizon is gravelly sandy loam, and the lower part is sandy loam.

The Bw horizon has value of 4 or 5 moist and 6 to 8 dry, and it has chroma of 4 to 6 moist or dry. It is sandy loam or gravelly sandy loam.

Stinger Series

The Stinger series consists of moderately deep, somewhat excessively drained soils on side slopes. These soils formed in colluvium derived from granodiorite. Slopes are 60 to 90 percent. The mean annual precipitation is about 55 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Stinger loam in an area of Buckshot-Stinger complex, 60 to 90 percent north slopes; 2,500 feet north and 1,600 feet east of the southwest corner of sec. 21, T. 27 S., R. 3 W.

Oi—0.5 inch to 0; slightly decomposed needles and twigs.

A—0 to 3 inches; dark brown (10YR 3/3) loam, light olive brown (2.5Y 5/4) dry; moderate very fine and fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots and common fine, medium, and coarse roots; 5 percent gravel; slightly acid; clear smooth boundary.

Bw1—3 to 17 inches; light olive brown (2.5Y 5/4) sandy loam, pale yellow (2.5Y 7/3) dry; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; 5 percent gravel; moderately acid; abrupt smooth boundary.

Bw2—17 to 30 inches; light olive brown (2.5Y 5/4) sandy loam, pale yellow (2.5Y 7/3) dry; weak fine and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine roots and few fine, medium, and coarse roots; 5 percent gravel; moderately acid; abrupt wavy boundary.

Cr—30 inches; weathered granodiorite.

Depth to bedrock is 20 to 40 inches.

The A horizon has hue of 2.5Y or 10YR, value of 3 or 4 moist and 5 or 6 dry, and chroma of 3 or 4 moist or dry.

The Bw horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 4 or 5 moist and 6 or 7 dry, and chroma of 3 to 6 moist or dry. The horizon is sandy loam or loam.

Stockel Series

The Stockel series consists of very deep, somewhat poorly drained soils on toeslopes and alluvial fans. These soils formed in mixed alluvium and colluvium derived from sandstone and siltstone. Slopes are 3 to 12 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Stockel fine sandy loam, 3 to 12 percent slopes; 1,300 feet west and 600 feet south of the northeast corner of sec. 13, T. 27 S., R. 7 W.

A1—0 to 4 inches; dark brown (10YR 3/3) fine sandy loam, pale brown (10YR 6/3) dry; many fine and medium prominent strong brown (7.5YR 5/8) mottles; moderate very fine and fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; few very fine irregular pores; moderately acid; clear smooth boundary.

A2—4 to 9 inches; dark brown (10YR 3/3) fine sandy loam, pale brown (10YR 6/3) dry; many fine and medium prominent strong brown (7.5YR 5/8) mottles; moderate very fine and fine granular and subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine and fine tubular pores; moderately acid; clear smooth boundary.

Bt1—9 to 15 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; many fine and medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine tubular pores; few distinct dark brown (7.5YR 4/4) clay films on faces of peds and in pores; moderately acid; clear smooth boundary.

Bt2—15 to 23 inches; dark yellowish brown (10YR 4/4) loam, light yellowish brown (10YR 6/4) dry; many fine and medium distinct grayish brown (10YR 5/2) and brownish yellow (10YR 6/8) mottles; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine roots; many very fine, fine, and medium tubular pores; few distinct dark brown (7.5YR 4/4) clay films on faces of peds and in pores; common medium prominent very dark gray (10YR 3/1) manganese stains; strongly acid; gradual smooth boundary.

Bt3—23 to 31 inches; dark yellowish brown (10YR 4/4) gravelly loam, light yellowish brown (10YR 6/4) dry; many fine and medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 4/6) mottles; moderate medium and coarse subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few very fine roots; many very fine, fine, and medium tubular pores; few distinct dark brown (7.5YR 4/4) clay films on faces of peds, in pores, and bridging some sand grains; many fine and medium prominent very dark gray (10YR 3/1) manganese stains; 20 percent fine sandstone gravel; strongly acid; clear smooth boundary.

BCt—31 to 43 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam, light yellowish brown (10YR 6/4) dry; many fine and medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 4/6) mottles; weak medium and coarse subangular blocky structure; soft, friable, slightly sticky and nonplastic; few very fine roots; many very fine, fine, and medium tubular pores; few faint dark brown (7.5YR 4/4) clay films in pores and bridging some sand grains; many fine and medium prominent very dark gray (10YR 3/1) manganese stains; 25 percent sandstone gravel; strongly acid; abrupt smooth boundary.

2Bt—43 to 63 inches; mottled, grayish brown (10YR 5/2) and strong brown (10YR 5/8) clay; weak very coarse prismatic structure parting to coarse and very coarse subangular blocky; very hard, very firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; common distinct clay films on faces of peds; strongly acid.

Depth to bedrock is 60 inches or more. Depth to the 2Bt horizon is 40 to 60 inches or more. The profile has hue of 10YR or 7.5YR. Mottles that are a result of wetness are throughout the profile.

The A horizon has value of 2 or 3 moist and 5 or 6 dry, and it has chroma of 2 or 3 moist or dry.

The Bt horizon has value of 3 or 4 moist and 6 or 7 dry, and it has chroma of 3 or 4 moist or dry. It is loam, gravelly loam, or gravelly sandy loam.

The 2Bt horizon has value of 5 or 6 moist or dry, and it has chroma of 2 or 3 moist and 7 or 8 dry.

Sutherlin Series

The Sutherlin series consists of very deep, moderately well drained soils on toeslopes, footslopes, side slopes, and alluvial fans (fig. 24, p. 557). These soils formed in alluvium and colluvium derived from sandstone and siltstone. Slopes are 3 to 50 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Sutherlin silt loam, 3 to 12 percent slopes; 900 feet north and 1,260 feet west of the southeast corner of sec. 16, T. 27 S., R. 7 W.

A1—0 to 2 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; common fine distinct yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles concentrated in root channels; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine irregular and tubular pores; moderately acid; gradual smooth boundary.

A2—2 to 8 inches; dark yellowish brown (10YR 3/4) silt loam, yellowish brown (10YR 5/4) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; moderately acid; gradual smooth boundary.

BA—8 to 16 inches; dark yellowish brown (10YR 3/4) silt loam, light yellowish brown (10YR 6/4) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine and few medium tubular pores; moderately acid; clear smooth boundary.

Bt1—16 to 21 inches; dark yellowish brown (10YR 4/4) silty clay loam, light yellowish brown (10YR 6/4) dry; common fine faint yellowish brown (10YR 5/8) mottles; moderate medium and coarse subangular blocky structure; slightly hard, firm, sticky and plastic; common fine and medium roots; many very fine and fine tubular pores; few faint dark brown (7.5YR 3/4) clay films on faces of peds and in pores; many very fine and fine prominent very dark gray (10YR 3/1) manganese stains; moderately acid; clear smooth boundary.

Bt2—21 to 30 inches; dark yellowish brown (10YR 4/6) silty clay loam, light yellowish brown (10YR 6/4) dry; many medium distinct strong brown (7.5YR 5/8 and 7.5YR 4/6) and yellowish brown (10YR 5/8) mottles; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots and few medium roots; many very fine and fine tubular pores; common distinct dark brown (7.5YR 3/4) clay films on faces of peds and in pores; many very fine and fine prominent very dark gray (10YR 3/1) manganese stains; moderately acid; abrupt smooth boundary.

2BC—30 to 34 inches; dark yellowish brown (10YR 4/4) silty clay, brownish yellow (10YR 6/6) dry; many medium and coarse prominent grayish brown (10YR 5/2) and yellowish red (5YR 4/6) mottles; weak medium and coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; few fine and medium roots concentrated along faces of peds; few fine tubular pores; many fine prominent very dark gray (10YR 3/1) manganese stains; strongly acid; gradual smooth boundary.

2C1—34 to 43 inches; yellowish brown (10YR 5/6) silty clay, brownish yellow (10YR 6/6) dry; many medium and coarse distinct light brownish gray (10YR 6/2) and yellowish red (5YR 4/6) mottles; massive; extremely hard, extremely firm, very sticky and very plastic; few fine roots; very few very fine tubular pores; many medium prominent very dark gray (10YR 3/1) manganese stains; strongly acid; clear smooth boundary.

2C2—43 to 51 inches; mottled, yellowish brown (10YR 5/6 and 5/8) and light brownish gray (10YR 6/2) silty clay; massive; extremely hard, extremely firm, very sticky and very plastic; few fine roots; few very fine tubular pores; common coarse prominent very dark gray (10YR 3/1) manganese stains; 5 percent soft siltstone gravel; strongly acid; gradual smooth boundary.

2C3—51 to 60 inches; mottled, yellowish brown (10YR 5/6 and 5/8) and light brownish gray (10YR 6/2) silty clay; massive; extremely hard, extremely firm, very sticky and very plastic; many coarse prominent very dark gray (10YR 3/1) manganese stains; 15 percent soft siltstone gravel; strongly acid.

Depth to bedrock is 60 inches or more. Depth to the 2BC horizon is 24 to 36 inches. The solum has hue of 10YR, 7.5YR, or 5YR. Mottles that are a result of wetness are throughout the profile.

The A horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 2 to 4 moist or dry.

The Bt horizon has value of 3 or 4 moist and 5 or 6 dry, and it has chroma of 4 to 6 moist or dry. It is silty clay loam or clay loam.

The 2BC and 2C horizons have hue of 2.5Y or 10YR, value of 4 or 5 moist and 6 or 7 dry, and chroma of 3 to 6 moist and 4 to 6 dry. The horizons are clay or silty clay.

Svensen Series

The Svensen series consists of deep, well drained soils on side slopes and ridges. These soils formed in colluvium and residuum derived from sandstone. Slopes are 3 to 75 percent. The mean annual precipitation is about 80 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of Svensen loam in an area of Svensen-Millicoma-Reedsport complex, 35 to 75 percent slopes; 1,050 feet east and 1,320 feet north of the southwest corner of sec. 5, T. 22 S., R. 12 W.

Oi—2 inches to 0; slightly decomposed spruce needles, twigs, stems, and leaves.

A1—0 to 6 inches; very dark brown (10YR 2/2) loam, dark brown (10YR 4/3) dry; strong very fine and fine granular structure; soft, friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine and fine irregular pores; 10 percent soft gravel; strongly acid; clear smooth boundary.

A2—6 to 12 inches; very dark grayish brown (10YR 3/2) loam, dark brown (10YR 4/3) dry; moderate fine and medium subangular blocky structure parting to fine and medium granular; soft, friable, slightly sticky and slightly plastic; common fine and medium roots; many fine irregular pores; 10 percent soft gravel; very strongly acid; clear smooth boundary.

BA—12 to 21 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure; soft, friable, sticky and slightly plastic; few fine roots; many fine tubular and irregular pores; 15 percent soft sandstone gravel; very strongly acid; clear wavy boundary.

Bw1—21 to 29 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak medium and coarse subangular blocky structure; soft, friable, sticky and plastic; few fine roots; many very fine and fine tubular and irregular pores; 15 percent soft sandstone gravel; very strongly acid; clear wavy boundary.

Bw2—29 to 41 inches; dark brown (10YR 4/3) clay loam, yellowish brown (10YR 5/4) dry; weak coarse subangular blocky structure; slightly hard, firm, sticky and plastic; few fine roots; many very fine and fine tubular and irregular pores; 10 percent soft sandstone gravel; very strongly acid; clear smooth boundary.

C—41 to 52 inches; dark yellowish brown (10YR 4/4) loam, yellowish brown (10YR 5/4) dry; massive; soft, friable, slightly sticky and slightly plastic; common very fine and fine tubular pores; 40 percent soft sandstone gravel and cobbles; very strongly acid; abrupt wavy boundary.

Cr—52 inches; weathered sandstone.

Depth to bedrock is 40 to 60 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bw horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 2 to 5 moist or dry. It is loam or clay loam.

The C horizon has variegated colors. It is loam, fine sandy loam, or sandy loam and is 15 to 50 percent soft rock fragments.

Sweetbriar Series

The Sweetbriar series consists of very deep, well drained soils on side slopes and ridges. These soils formed in residuum and colluvium derived from volcanic rock. Slopes are 3 to 60 percent. The mean annual precipitation is about 50 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Sweetbriar silty clay loam in an area of Zing-Sweetbriar complex, 30 to 60 percent slopes; 2,260 feet south and 735 feet east of the northwest corner of sec. 14, T. 30 S., R. 2 W.

Oi—1.5 inches to 0; slightly decomposed needles, leaves, and twigs.

A1—0 to 3 inches; very dark grayish brown (10YR

3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium granular structure and moderate very fine subangular blocky; hard, firm, sticky and plastic; many very fine roots and common fine, medium, and coarse roots; many very fine and fine irregular pores; 10 percent gravel; moderately acid; clear smooth boundary.

A2—3 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate very fine and fine subangular blocky structure; very hard, firm, sticky and plastic; many very fine roots and common fine, medium, and coarse roots; common very fine and fine irregular pores; 10 percent gravel; moderately acid; clear smooth boundary.

Bt1—8 to 18 inches; dark brown (10YR 3/3) clay, brown (10YR 4/3) dry; moderate fine and medium subangular blocky structure; very hard, very firm, sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine and fine tubular pores; common faint clay films on faces of peds and in pores; 5 percent gravel; moderately acid; clear wavy boundary.

Bt2—18 to 23 inches; dark yellowish brown (10YR 4/4) clay, yellowish brown (10YR 5/4) dry; moderate medium and coarse subangular blocky structure; very hard, very firm, very sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine and fine tubular pores; common distinct clay films on faces of peds and in pores; 5 percent gravel; strongly acid; clear wavy boundary.

Bt3—23 to 29 inches; dark yellowish brown (10YR 4/6) clay, yellowish brown (10YR 5/6) dry; moderate medium and coarse subangular blocky structure; very hard, very firm, very sticky and plastic; common very fine, fine, and medium roots; common very fine and fine tubular pores; common distinct clay films on faces of peds and in pores; 5 percent gravel; strongly acid; clear wavy boundary.

Bt4—29 to 38 inches; dark yellowish brown (10YR 4/6) clay, yellowish brown (10YR 5/6) dry; moderate medium and coarse subangular blocky structure; very hard, very firm, very sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine and fine tubular pores; common distinct clay films on faces of peds and in pores; very strongly acid; clear wavy boundary.

Bt5—38 to 53 inches; yellowish brown (10YR 5/6) silty clay loam, brownish yellow (10YR 6/6) dry; moderate medium and coarse subangular blocky structure; very hard, very firm, very sticky and plastic; common very fine, fine, medium, and coarse roots; common fine tubular pores; common distinct clay films on faces of peds and in pores; very strongly acid; clear wavy boundary.

Bt6—53 to 60 inches; dark yellowish brown (10YR 4/4) clay loam, yellowish brown (10YR 5/4) dry; weak very fine and fine subangular blocky structure; slightly hard, firm, sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine and fine irregular pores; few distinct clay films on faces of peds; very strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist and 2 to 4 dry.

The upper part of the Bt horizon has value of 3 to 5 moist and 4 to 6 dry, and it has chroma of 3 to 6 moist or dry. It is silty clay or clay. The lower part of the Bt horizon has value of 3 to 5 moist and 4 to 6 dry, and it has chroma of 4 to 6 moist or dry. It is clay loam or silty clay loam.

Telemon Series

The Telemon series consists of very deep, somewhat poorly drained soils on side slopes and in swales. These soils formed in residuum and colluvium derived from volcanic tuff. Slopes are 3 to 60 percent. The mean annual precipitation is about 65 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of Telemon gravelly clay loam in an area of Thistleburn-Illahee-Telemon complex, 3 to 30 percent slopes; 2,730 feet east and 2,890 feet north of the southwest corner of sec. 32, T. 28 S., R. 2 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 8 inches; dark reddish brown (5YR 3/3) gravelly clay loam, reddish brown (5YR 5/3) dry; moderate fine and medium granular structure; slightly hard, firm, sticky and plastic; many very fine roots and common fine, medium, and coarse roots; many very fine irregular pores; 20 percent gravel; strongly acid; abrupt smooth boundary.

BAt—8 to 12 inches; dark reddish brown (5YR 3/3) clay, reddish brown (5YR 5/3) dry; moderate fine and medium subangular blocky structure; very hard, very firm, very sticky and plastic; common very fine, fine, medium, and coarse roots; common distinct clay films on faces of peds and in pores; many very fine and fine irregular pores;

5 percent gravel; moderately acid; abrupt smooth boundary.

2Btg1—12 to 16 inches; mottled, strong brown (7.5YR 5/8) and light olive gray (5Y 6/2) clay, reddish yellow (7.5YR 6/8) and light gray (5Y 7/1) dry; moderate medium and coarse subangular blocky structure; very hard, very firm, very sticky and plastic; common very fine, fine, and medium roots and few coarse roots; common very fine and fine tubular pores; common slickensides; common distinct clay films on faces of peds and in pores; moderately acid; clear smooth boundary.

2Btg2—16 to 22 inches; pale olive (5Y 6/3) clay, light olive gray (5Y 6/2) dry; many fine prominent strong brown (7.5YR 5/8) mottles, reddish yellow (7.5YR 6/8) dry; moderate medium and coarse subangular blocky structure; very hard, very firm, very sticky and plastic; common very fine and fine roots; common very fine and fine tubular pores; few slickensides; common distinct clay films on faces of peds and in pores; 5 percent gravel; moderately acid; clear smooth boundary.

2Btg3—22 to 28 inches; pale olive (5Y 6/4) clay, pale olive (5Y 6/3) dry; many fine prominent strong brown (7.5YR 5/8) mottles, reddish yellow (7.5YR 6/8) dry; moderate medium subangular blocky structure; very hard, firm, very sticky and plastic; common very fine and fine roots; common very fine tubular pores; common distinct clay films on faces of peds and in pores; 5 percent gravel; moderately acid; abrupt smooth boundary.

2Btg4—28 to 37 inches; light olive brown (2.5Y 5/4) clay, light yellowish brown (2.5Y 6/4) dry; common fine distinct strong brown (7.5YR 5/8) mottles, reddish yellow (7.5YR 6/8) dry; moderate medium and coarse subangular blocky structure; very hard, firm, very sticky and plastic; few very fine roots; common very fine tubular pores; common distinct and few prominent clay films on faces of peds and in pores; 10 percent gravel; moderately acid; clear smooth boundary.

2Btg5—37 to 48 inches; pale olive (5Y 6/4) clay loam, light yellowish brown (2.5Y 6/4) dry; common fine distinct strong brown (7.5YR 5/8) mottles, reddish yellow (7.5YR 6/8) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; common distinct clay films on faces of peds and in pores; 10 percent gravel; moderately acid; clear smooth boundary.

2Btg6—48 to 60 inches; olive yellow (5Y 6/6) clay loam, pale olive (5Y 6/4) dry; weak medium subangular blocky structure; hard, firm, sticky and plastic; few very fine tubular pores; few distinct clay films on faces of peds and in pores; 10 percent gravel; moderately acid.

Depth to bedrock is 60 inches or more. Mottles that are a result of wetness are throughout the 2Btg horizon.

The A horizon has hue of 7.5YR or 5YR, value of 4 or 5 dry, and chroma of 2 or 3 moist.

The matrix of the 2Btg horizon has hue of 2.5Y or 5Y, value of 5 or 6 moist and 6 or 7 dry, and chroma of 2 to 4 moist and 1 to 4 dry. The upper part of the horizon is clay or silty clay, and the lower part is clay loam.

Templeton Series

The Templeton series consists of very deep, well drained soils on side slopes. These soils formed in colluvium derived from sandstone and siltstone. Slopes are 30 to 75 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Templeton silt loam in an area of Templeton-Millicoma complex, 30 to 50 percent slopes; 715 feet east and 1,785 feet south of the northwest corner of sec. 27, T. 22 S., R. 12 W.

Oi—2 inches to 0; slightly decomposed needles and twigs.

A1—0 to 6 inches; dark brown (7.5YR 3/2) silt loam, dark brown (7.5YR 4/2) dry; moderate fine granular structure; soft, friable, slightly sticky and slightly plastic; many fine and medium roots; many very fine and fine irregular pores; 10 percent gravel; strongly acid; clear smooth boundary.

A2—6 to 11 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure parting to fine granular; soft, friable, slightly sticky and slightly plastic; common fine, medium, and coarse roots; many very fine and fine irregular pores; 5 percent gravel; strongly acid; clear smooth boundary.

BA—11 to 20 inches; dark yellowish brown (10YR 3/4) silt loam, yellowish brown (10YR 5/4) dry; weak fine and medium subangular blocky structure; soft, friable, sticky and slightly plastic; few fine and medium roots; many fine and medium tubular pores; strongly acid; gradual smooth boundary.

Bw1—20 to 32 inches; dark yellowish brown (10YR 3/4) silty clay loam, yellowish brown (10YR 5/4) dry; weak coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few medium roots; common fine and medium tubular pores; 5 percent gravel; very strongly acid; clear smooth boundary.

Bw2—32 to 52 inches; dark yellowish brown (10YR 3/4) silty clay loam, yellowish brown (10YR 5/4) dry; weak coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few fine roots; few fine and medium tubular pores; very strongly acid; gradual smooth boundary.

BC—52 to 60 inches; dark yellowish brown (10YR 3/4) silty clay loam, yellowish brown (10YR 5/4) dry; massive; slightly hard, friable, sticky and plastic; few fine tubular pores; very strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR, 7.5YR, or 5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The B horizon has value of 3 to 5 moist and 5 or 6 dry, and it has chroma of 4 to 8 moist and 4 to 6 dry. It is silty clay loam or silt loam.

Tethrick Series

The Tethrick series consists of very deep, well drained soils on side slopes. These soils formed in colluvium derived from granodiorite. Slopes are 60 to 90 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of Tethrick sandy loam in an area of Tethrick-Siskiyou complex, 60 to 90 percent north slopes; 1,100 feet west and 2,400 feet south of the northeast corner of sec. 30, T. 29 S., R. 4 W.

A—0 to 5 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 5/3) dry; weak fine granular structure; soft, friable, nonsticky and nonplastic; many very fine roots and few fine, medium, and coarse roots; common very fine irregular pores; 10 percent gravel; moderately acid; clear smooth boundary.

Bw1—5 to 18 inches; yellowish brown (10YR 5/4) sandy loam, very pale brown (10YR 7/3) dry; weak fine subangular blocky structure; very hard, firm, nonsticky and nonplastic; common very fine and fine roots and few medium and coarse roots; many very fine tubular pores; 10 percent gravel; moderately acid; gradual smooth boundary.

Bw2—18 to 29 inches; yellowish brown (10YR 5/4) sandy loam, very pale brown (10YR 7/4) dry; weak fine subangular blocky structure; very hard, firm, slightly sticky and nonplastic; common very fine and fine roots and few medium and coarse roots; many very fine tubular pores; 10 percent gravel; strongly acid; clear smooth boundary.

Bw3—29 to 46 inches; yellowish brown (10YR 5/4) sandy loam, light yellowish brown (10YR 6/4) dry; weak fine subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common very fine tubular pores; 5 percent gravel; strongly acid; abrupt smooth boundary.

BC—46 to 60 inches; light yellowish brown (10YR 6/4) sandy loam, very pale brown (10YR 7/4) dry; weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine, fine, medium, and coarse roots; common very fine tubular pores; 5 percent gravel; strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 2.5Y or 10YR.

The A horizon has value of 3 to 6 moist and 5 to 7 dry, and it has chroma of 2 or 3 moist or dry.

The B horizon has value of 4 to 7 moist and 5 to 8 dry, and it has chroma of 2 to 6 moist or dry. It is sandy loam or coarse sandy loam.

Thistleburn Series

The Thistleburn series consists of very deep, well drained soils on side slopes and ridges. These soils formed in residuum and colluvium derived from volcanic tuff. Slopes are 3 to 60 percent. The mean annual precipitation is about 65 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of Thistleburn clay loam in an area of Thistleburn-Illahee-Telemon complex, 3 to 30 percent slopes; 715 feet west and 1,785 feet south of the northeast corner of sec. 9, T. 29 S., R. 2 W.

Oi—0.5 inch to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 10 inches; very dark gray (10YR 3/1) clay loam, dark grayish brown (10YR 4/2) dry; moderate very fine, fine, and medium granular structure; hard, firm, very sticky and plastic; many very fine roots and common fine and medium roots; many very fine irregular pores; very strongly acid; abrupt smooth boundary.

Bt1—10 to 19 inches; dark yellowish brown (10YR 3/4) clay, yellowish brown (10YR 5/4) dry; moderate fine and medium subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine, fine, medium, and coarse roots; many very fine irregular pores; common distinct clay films on faces of peds and in pores; very strongly acid; abrupt wavy boundary.

Bt2—19 to 31 inches; dark yellowish brown (10YR 3/4) clay, yellowish brown (10YR 5/4) dry;

moderate medium and coarse subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine, fine, and medium roots; common very fine and fine tubular pores; many prominent clay films on faces of peds and in pores; very strongly acid; abrupt wavy boundary.

Bt3—31 to 40 inches; dark yellowish brown (10YR 4/6) clay, brownish yellow (10YR 6/6) dry; moderate medium and coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; common very fine, fine, and medium roots; common very fine and fine tubular pores; many prominent clay films on faces of peds and in pores; very strongly acid; abrupt wavy boundary.

Bt4—40 to 49 inches; yellowish brown (10YR 5/8) clay, yellow (10YR 7/8) dry; moderate medium and coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine and medium roots; common fine tubular pores; common distinct clay films on faces of peds and in pores; very strongly acid; clear wavy boundary.

Bt5—49 to 55 inches; strong brown (7.5YR 5/8) silty clay, reddish yellow (10YR 7/8) dry; moderate medium and coarse subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine, fine, and medium roots; common fine tubular pores; common distinct clay films on faces of peds and in pores; very strongly acid; clear wavy boundary.

BCt—55 to 70 inches; strong brown (7.5YR 5/8) silty clay loam, reddish yellow (10YR 7/8) dry; weak medium and coarse subangular blocky structure; hard, firm, very sticky and plastic; few very fine and fine roots; common fine tubular pores; few distinct clay films on faces of peds and in pores; very strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 1 to 3 moist and 2 or 3 dry.

The Bt horizon has value of 3 to 5 moist and 5 to 7 dry, and it has chroma of 4 to 8 moist or dry. It is silty clay or clay.

Threeforks Series

The Threeforks series consists of very deep, well drained soils on side slopes. These soils formed in colluvium and residuum derived from mica schist. Slopes are 30 to 90 percent. The mean annual precipitation is about 55 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Threeforks loam, 60 to 90 percent south slopes; 1,365 feet west and 2,100 feet north of the southeast corner of sec. 17, T. 30 S., R. 2 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak fine and medium granular structure; slightly hard, firm, sticky and slightly plastic, common very fine, fine, medium, and coarse roots; few very fine tubular and irregular pores; 10 percent gravel; moderately acid; clear smooth boundary.

BA—3 to 11 inches; very dark grayish brown (10YR 3/2) loam, brown (10YR 5/3) dry; weak very fine, fine, and medium subangular blocky structure; hard, firm, sticky and slightly plastic; common very fine, fine, medium, and coarse roots; few very fine tubular and irregular pores; 5 percent gravel; moderately acid; clear wavy boundary.

Bw1—11 to 20 inches; very dark grayish brown (10YR 3/2) loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure; hard, firm, sticky and slightly plastic; common very fine, fine, medium, and coarse roots; common very fine and fine tubular and irregular pores; 5 percent gravel; moderately acid; clear wavy boundary.

Bw2—20 to 33 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure; hard, firm, sticky and slightly plastic; common very fine and fine roots and few medium and coarse roots; common very fine and fine tubular and irregular pores; 10 percent gravel; moderately acid; clear wavy boundary.

Bw3—33 to 49 inches; dark brown (10YR 3/3) gravelly clay loam, brown (10YR 5/3) dry; weak medium and coarse subangular blocky structure; hard, firm, sticky and plastic, few very fine and fine roots; common very fine and fine tubular and irregular pores; few distinct clay films on faces of peds and in pores; 30 percent gravel; moderately acid; clear wavy boundary.

BC—49 to 60 inches; dark brown (10YR 3/3) very gravelly clay loam, brown (10YR 5/3) dry; weak medium and coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots; common very fine and fine tubular and irregular pores; few distinct clay films on faces of peds and in pores; 45 percent gravel and 10 percent cobbles; strongly acid.

Depth to bedrock is 60 inches or more.

The A and BA horizons have value of 2 or 3 moist and 4 or 5 dry, and they have chroma of 1 to 3 moist and 2 or 3 dry.

The Bw horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 3 or 4 moist and 5 or 6 dry, and chroma of 2 to 4 moist or dry. The horizon is loam, gravelly loam, or gravelly clay loam.

The BC horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 3 or 4 moist and 5 or 6 dry, and chroma of 3 or 4 moist or dry. The horizon is gravelly clay loam, gravelly loam, or very gravelly clay loam and is 20 to 55 percent rock fragments.

Tishar Series

The Tishar series consists of deep, well drained soils on side slopes and ridges. These soils formed in residuum and colluvium derived from sandstone, siltstone, volcanic rock, and metamorphic rock. Slopes are 3 to 80 percent. The mean annual precipitation is about 45 inches, and mean annual air temperature is about 51 degrees F.

Typical pedon of Tishar gravelly silty clay loam in an area of Tishar-McGinnis complex, 30 to 60 percent south slopes; 1,000 feet north and 350 feet west of the southeast corner of sec. 5, T. 31 S., R. 8 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 6 inches; dark brown (7.5YR 3/2) gravelly silty clay loam, light brown (7.5YR 6/4) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine and medium irregular pores; 20 percent gravel; moderately acid; clear wavy boundary.

AB—6 to 13 inches; dark brown (7.5YR 4/4) gravelly silty clay loam, light brown (7.5YR 6/4) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; many very fine, fine, and medium roots; many very fine, fine, and medium tubular pores; 20 percent gravel; strongly acid; clear wavy boundary.

BAt—13 to 22 inches; yellowish red (5YR 4/6) very gravelly silty clay, pink (7.5YR 7/4) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common fine, medium, and coarse roots; few very fine tubular pores; common faint clay films on faces of peds; 40 percent gravel and 10 percent cobbles; strongly acid; gradual smooth boundary.

Bt1—22 to 40 inches; yellowish red (5YR 4/6) very gravelly clay, reddish yellow (5YR 6/6) dry; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few fine and medium roots; few very fine tubular pores; many distinct clay films on faces of peds; 40 percent gravel and 10 percent cobbles; strongly acid; gradual smooth boundary.

Bt2—40 to 52 inches; yellowish red (5YR 4/6) very gravelly clay, reddish yellow (7.5YR 6/6) dry; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few fine roots; few very fine tubular pores; many distinct clay films on faces of peds; 40 percent gravel and 10 percent cobbles; strongly acid; clear wavy boundary.

Cr—52 inches; weathered siltstone.

Depth to bedrock is 40 to 60 inches.

The A horizon has hue of 7.5YR or 5YR, value of 3 to 5 moist and 6 or 7 dry, and chroma of 2 to 4 moist or dry.

The Bt horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 4 or 5 moist and 5 to 7 dry, and chroma of 6 to 8 moist or dry. The horizon is very gravelly clay or very gravelly silty clay.

Umpcoos Series

The Umpcoos series consists of shallow, well drained soils on side slopes, ridges, and headwalls. These soils formed in colluvium derived from sandstone. Slopes are 30 to 110 percent. The mean annual precipitation is about 85 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Umpcoos very gravelly sandy loam in an area of Umpcoos-Rock outcrop-Damewood complex, 60 to 90 percent slopes; 2,100 feet south and 50 feet west of the northeast corner of sec. 7, T. 21 S., R. 9 W.

Oi—4 inches to 0; slightly decomposed leaves, needles, and twigs.

A—0 to 4 inches; dark brown (7.5YR 3/2) very gravelly sandy loam, brown (7.5YR 4/4) dry; moderate very fine and fine granular structure; soft, friable, slightly sticky and nonplastic; many very fine, fine, and medium roots and few coarse roots; many very fine irregular pores; 35 percent gravel and 5 percent cobbles; very strongly acid; clear smooth boundary.

Bw—4 to 17 inches; dark brown (7.5YR 3/4) very gravelly sandy loam, brown (7.5YR 5/4) dry; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; many fine and medium roots and common coarse roots; many very fine tubular and irregular pores; 30 percent

gravel and 15 percent cobbles; very strongly acid; abrupt smooth boundary.
R—17 inches; sandstone.

Depth to bedrock is 10 to 20 inches. The profile has hue of 2.5Y, 10YR, or 7.5YR.

The A horizon has value of 3 to 5 moist and 4 to 6 dry, and it has chroma of 2 to 4 moist or dry. It is 35 to 60 percent rock fragments.

The Bw horizon has value of 3 to 5 moist and 5 or 6 dry, and it has chroma of 2 to 4 moist or dry. It is extremely gravelly loam, very gravelly sandy loam, or very cobbly loam and is 35 to 75 percent rock fragments.

Vena Series

The Vena series consists of moderately deep, well drained soils on side slopes and headwalls. These soils formed in colluvium derived from welded tuff. Slopes are 60 to 100 percent. The mean annual precipitation is about 55 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Vena very gravelly loam in an area of Vena-Rock outcrop complex, 60 to 100 percent slopes; 1,100 feet west and 2,700 feet south of the northeast corner of sec. 10, T. 26 S., R. 2 W.

Oi—0.5 inch to 0; slightly decomposed needles and twigs.
A—0 to 5 inches; dark yellowish brown (10YR 4/4) very gravelly loam, pale brown (10YR 6/3) dry; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots, common fine roots, and few medium roots; many very fine and common fine irregular pores; 45 percent gravel and 15 percent cobbles; slightly acid; clear smooth boundary.
Bw—5 to 21 inches; dark yellowish brown (10YR 4/4) extremely gravelly loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots and few medium roots; common very fine tubular pores; 55 percent gravel and 20 percent cobbles; slightly acid; clear wavy boundary.
R—21 inches; tuff.

Depth to bedrock is 20 to 40 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 2 to 4 moist and 4 to 6 dry, and it has chroma of 1 to 4 moist or dry. It is 35 to 60 percent rock fragments.

The Bw horizon has value of 4 or 5 moist and 6 to 8 dry, and it has chroma of 1 to 4 moist or dry. It is very gravelly loam, very cobbly loam, or extremely gravelly loam and is 35 to 80 percent rock fragments.

Veneta Series

The Veneta series consists of very deep, moderately well drained soils on old terraces, alluvial fans, and footslopes. These soils formed in mixed alluvium and colluvium derived from sandstone and siltstone. Slopes are 0 to 20 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Veneta loam, 0 to 12 percent slopes; 2,640 feet north and 1,400 feet west of the southeast corner of sec. 1, T. 27 S., R. 7 W.

A1—0 to 4 inches; dark brown (7.5YR 3/4) loam, brown (7.5YR 5/4) dry; moderate fine and medium granular structure; soft, very friable, slightly sticky and nonplastic; many very fine and fine roots; many very fine and fine irregular and tubular pores; moderately acid; clear smooth boundary.
A2—4 to 9 inches; dark brown (7.5YR 3/4) loam, light brown (7.5YR 6/4) dry; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; many very fine and fine roots; many very fine and fine tubular pores; few faint coatings of clean very fine sand and silt on faces of peds and in pores; moderately acid; clear smooth boundary.
BA—9 to 18 inches; strong brown (7.5YR 4/6) loam, strong brown (7.5YR 5/6) dry; moderate medium and coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine and fine roots; many very fine and fine and few medium tubular pores; few faint coatings of clean very fine sand and silt on faces of peds and in pores; moderately acid; clear smooth boundary.
BAt—18 to 23 inches; brown (7.5YR 4/4) clay loam, brown (7.5YR 5/4) dry; moderate fine, medium, and coarse subangular blocky structure, soft, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine tubular pores; few faint clay films on faces of peds; strongly acid; clear smooth boundary.
Bt1—23 to 30 inches; strong brown (7.5YR 4/6) clay loam, brown (7.5YR 5/4) dry; few fine reddish yellow (7.5YR 6/6) and yellowish red (5YR 5/6) mottles; moderate medium and coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine and fine roots; many very fine and fine irregular and tubular pores; common distinct dark brown (7.5YR 3/4) clay films on faces

of peds and in pores; strongly acid; clear smooth boundary.

Bt2—30 to 38 inches; grayish brown (10YR 5/2) clay, light yellowish brown (10YR 6/4) dry; common fine strong brown (7.5YR 5/8) mottles; weak medium and coarse subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; many distinct clay films on faces of peds and in pores; many fine and medium prominent very dark gray (10YR 3/1) manganese stains; few fine shot fragments; strongly acid; clear smooth boundary.

2Bt—38 to 48 inches; mottled, strong brown (7.5YR 5/8) and grayish brown (10YR 5/2) clay; weak medium and coarse subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; many distinct clay films on faces of peds and in pores; many fine and medium prominent very dark gray (10YR 3/1) manganese stains; few fine shot fragments; strongly acid; clear smooth boundary.

2BCt—48 to 63 inches; mottled, strong brown (7.5YR 5/8) and light brownish gray (10YR 6/2) clay; weak medium and coarse subangular blocky structure; hard, firm, very sticky and plastic; few very fine roots; few very fine tubular pores; many distinct clay films on faces of peds and in pores; many fine and medium prominent very dark gray (10YR 3/1) manganese stains; 5 percent fine shot fragments; strongly acid.

Depth to bedrock is 60 inches or more. Depth to the 2Bt horizon is 24 to 40 inches. The profile has hue of 10YR or 7.5YR. Mottles that are a result of wetness are below a depth of 20 inches.

The A horizon has value of 3 or 4 moist and 5 or 6 dry, and it has chroma of 2 to 4 moist or dry.

The Bt horizon has value of 4 or 5 moist and 5 to 7 dry, and it has chroma of 4 to 6 moist or dry. It is clay loam, silty clay, or clay.

The 2Bt horizon is mottled clay with 55 to 65 percent clay.

Vermisa Series

The Vermisa series consists of shallow, somewhat excessively drained soils on side slopes and headwalls. These soils formed in colluvium derived from sandstone and metamorphic rock. Slopes are 30 to 100 percent. The mean annual precipitation is about 50 inches, and the mean annual air temperature is about 48 degrees F.

Typical pedon of Vermisa very gravelly loam in an area of Beekman-Vermisa complex, 60 to 90 percent south slopes; 1,980 feet west and 1,350 feet south of the northeast corner of sec. 15, T. 31 S., R. 8 W.

A—0 to 4 inches; dark yellowish brown (10YR 4/4) very gravelly loam, very pale brown (10YR 7/3) dry; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; many very fine irregular pores; 40 percent gravel and 15 percent cobbles; neutral; clear wavy boundary.

Bw—4 to 17 inches; yellowish brown (10YR 5/4) extremely gravelly loam, very pale brown (10YR 7/3) dry; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common very fine, fine, and medium tubular pores; 55 percent gravel and 20 percent cobbles; slightly acid; clear wavy boundary.

R—17 inches; graywacke.

Depth to bedrock is 10 to 20 inches. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 3 to 5 moist and 5 to 7 dry, and it has chroma of 2 to 4 moist or dry. It is 35 to 60 percent rock fragments.

The Bw horizon has value of 4 or 5 moist and 6 or 7 dry, and it has chroma of 3 to 6 moist or dry. It is very gravelly loam, very gravelly silt loam, or extremely gravelly loam and is 35 to 80 percent rock fragments.

Waldo Series

The Waldo series consists of very deep, poorly drained soils on flood plains. These soils formed in clayey alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Waldo silty clay loam, 0 to 3 percent slopes; 3,000 feet west and 2,500 feet north of the southeast corner of sec. 13, T. 25 S., R. 6 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate very fine granular structure; slightly hard, friable, sticky and plastic; many very fine and common fine roots; many very fine irregular pores; moderately acid; abrupt smooth boundary.

A—7 to 11 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; strong very fine granular structure; slightly hard, friable, sticky and plastic; many very fine and common fine roots; many very fine irregular pores; moderately acid; abrupt smooth boundary.

Bg1—11 to 24 inches; very dark grayish brown (10YR 3/2) clay, grayish brown (10YR 5/2) dry; common medium distinct very dark gray (10YR 3/1) and strong brown (7.5YR 5/8) mottles; strong coarse prismatic structure; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; moderately acid; clear smooth boundary.

Bg2—24 to 60 inches; gray (2.5Y N 5/0) clay, light gray (2.5Y N 6/0) dry; common medium prominent strong brown (7.5YR 5/8) mottles; strong coarse prismatic structure; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; moderately acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 1 or 2 moist or dry.

The Bg horizon has hue of 10YR or 2.5Y or is neutral. It has value of 3 to 5 moist and 5 to 7 dry, and it has chroma of 0 to 2 moist or dry. It is silty clay or clay.

Waldport Series

The Waldport series consists of very deep, excessively drained soils on recently stabilized sand dunes. These soils formed in eolian sand. Slopes are 0 to 70 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Waldport fine sand, 30 to 70 percent slopes; 1,635 feet west and 440 feet south of the northeast corner of sec. 25, T. 22 S., R. 13 W.

Oi—3 inches to 0; slightly decomposed needles and leaves.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) fine sand, grayish brown (10YR 5/2) dry; single grain; loose; many very fine, fine, and medium roots; many very fine irregular pores; few faint iron stains in root channels; very strongly acid; clear smooth boundary.

AC—3 to 14 inches; dark grayish brown (10YR 4/2) fine sand, light brownish gray (2.5Y 6/2) dry; single grain; loose; common very fine and fine roots; many very fine and fine irregular pores; common faint iron stains in root channels; strongly acid; clear smooth boundary.

C—14 to 62 inches; dark grayish brown (2.5Y 4/2) fine sand, light yellowish brown (2.5Y 6/4) dry; single grain; loose; few very fine and fine roots; many very fine and fine irregular pores; few faint iron stains in root channels; strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 10YR or 2.5Y, value of 2 to 4 moist and 5 or 6 dry, and chroma of 1 or 2 moist or dry.

The AC horizon has hue of 10YR or 2.5Y, value of 3 to 5 moist and 4 to 6 dry, and chroma of 2 to 4 moist or dry.

The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 6 moist and 4 to 7 dry, and chroma of 1 to 4 moist or dry.

Wasson Series

The Wasson series consists of very deep, poorly drained soils in swales on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Wasson loam, 0 to 3 percent slopes; 2,175 feet north and 625 feet east of the southwest corner of sec. 4, T. 21 S., R. 10 W.

Oi—2 inches to 0; slightly decomposed leaves.

A—0 to 8 inches; very dark grayish brown (2.5Y 3/2) loam, grayish brown (2.5Y 5/2) dry; common fine and medium distinct dark brown (7.5YR 3/4) mottles; moderate fine and medium granular and subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots and many fine and medium roots; many fine irregular pores; moderately acid; clear smooth boundary.

AC—8 to 12 inches; very dark grayish brown (2.5Y 3/2) very fine sandy loam, grayish brown (2.5Y 5/2) dry; many medium and coarse distinct dark brown (7.5YR 3/4) mottles; weak fine and medium subangular blocky structure parting to granular; soft, very friable, slightly sticky and slightly plastic; common very fine roots and many fine and medium roots; many fine tubular pores; moderately acid; clear smooth boundary.

Cg1—12 to 23 inches; very dark gray (5Y 3/1) loamy fine sand, light brownish gray (2.5Y 6/2) dry; common medium and coarse prominent dark brown (7.5YR 3/4) mottles; massive; soft, very friable, nonsticky and nonplastic; few fine and common medium roots; few fine and common medium irregular pores; strongly acid; clear smooth boundary.

Cg2—23 to 43 inches; very dark gray (5Y 3/1) fine sandy loam, light brownish gray (2.5Y 6/2) dry; few fine faint dark yellowish brown (10YR 3/4) mottles; massive; soft, very friable, slightly sticky and nonplastic; common very fine and fine irregular pores; very strongly acid; clear smooth boundary.

Cg3—43 to 52 inches; very dark gray (5Y 3/1) loamy fine sand, grayish brown (2.5Y 5/2) dry; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine irregular pores; very strongly acid; clear smooth boundary.

Cg4—52 to 60 inches; very dark gray (5Y 3/1) fine sandy loam, grayish brown (2.5Y 5/2) dry; massive; soft, very friable, slightly sticky and nonplastic; common very fine irregular pores; very strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 2.5Y or 10YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 2 or 3 moist or dry.

The AC horizon, where present, has colors similar to those of the A horizon.

The Cg horizon has hue of 10YR to 5Y, value of 3 to 5 moist and 5 to 7 dry, and chroma of 1 moist and 1 or 2 dry. The horizon is stratified very fine sandy loam to loamy fine sand.

Willanch Series

The Willanch series consists of very deep, poorly drained soils in swales on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 80 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Willanch fine sandy loam, 0 to 3 percent slopes; 2,500 feet west and 10 feet north of the southeast corner of sec. 1, T. 22 S., R. 12 W.

A—0 to 11 inches; very dark grayish brown (10YR 3/2) fine sandy loam, brown (10YR 5/3) dry; common medium distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine and few fine roots; many very fine tubular pores; moderately acid; abrupt smooth boundary.

AC—11 to 20 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine roots; many very fine tubular pores; moderately acid; clear smooth boundary.

C—20 to 35 inches; dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; many medium distinct strong brown (7.5YR 5/6) mottles; massive; slightly hard, friable, nonsticky and nonplastic; few very fine roots; common very fine tubular pores; moderately acid; abrupt wavy boundary.

Cg—35 to 60 inches; gray (2.5Y 5/0) loamy fine sand, light gray (2.5Y 6/0) dry; many medium distinct strong brown (7.5YR 5/6) mottles; single grain; loose, nonsticky and nonplastic; few very fine roots; common very fine and fine tubular pores; moderately acid.

Depth to bedrock is 60 inches or more. Mottles that are a result of wetness are throughout the profile.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The AC and C horizons have hue of 10YR, value of 4 or 5 moist and 5 to 7 dry, and chroma of 2 or 3 moist or dry. The horizons are sandy loam or fine sandy loam.

The Cg horizon has hue of 2.5Y, value of 4 or 5 moist and 5 to 7 dry, and chroma of 0 or 1 moist or dry. The horizon is loamy fine sand or loamy sand.

Windygap Series

The Windygap series consists of deep, well drained soils on toeslopes, footslopes, side slopes, and ridges. These soils formed in colluvium and residuum derived from sandstone and siltstone. Slopes are 2 to 60 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Windygap silt loam, 12 to 30 percent slopes; 1,215 feet west and 660 feet north of the southeast corner of sec. 12, T. 24 S., R. 6 W.

A1—0 to 3 inches; dark brown (7.5YR 3/4) silt loam, brown (7.5YR 5/4) dry; moderate fine and medium granular structure; hard, firm, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine irregular and tubular pores; strongly acid; clear smooth boundary.

A2—3 to 7 inches; dark brown (7.5YR 3/4) silt loam, brown (7.5YR 5/4) dry; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine irregular and tubular pores; strongly acid; clear smooth boundary.

Bt1—7 to 17 inches; dark red (2.5YR 3/6) silty clay, red (2.5YR 4/6) crushed, yellowish red (5YR 4/6) dry; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; common fine and medium roots; many very fine and fine irregular and tubular pores; few faint dark red (2.5YR 3/6) clay films on faces of peds and in pores; very strongly acid; clear smooth boundary.

Bt2—17 to 43 inches; dark red (2.5YR 3/6) silty clay, red (2.5YR 4/6) crushed, yellowish red (5YR 4/6) dry; strong medium and coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine, fine, and medium roots; common very fine and fine tubular pores; many distinct dark red (2.5YR 3/6) clay films on faces of peds and in pores; 10 percent soft siltstone gravel; very strongly acid; clear smooth boundary.

Bt3—43 to 55 inches; dark red (2.5YR 3/6) silty clay, red (2.5YR 4/6) crushed and dry; moderate medium and coarse subangular blocky structure; very hard, very firm, sticky and plastic; few very fine roots; few very fine and fine tubular pores; many distinct dark red (2.5YR 3/6) clay films on faces of peds and in pores; 10 percent soft siltstone gravel; very strongly acid; clear smooth boundary.

Crt—55 inches; highly weathered siltstone; many prominent dark red (2.5YR 3/6) clay films on rock fragments; few very fine roots penetrating fissures.

Depth to bedrock is 40 to 60 inches.

The A horizon has hue of 7.5YR or 5YR moist and 10YR or 7.5YR dry, value of 3 to 5 moist and 4 to 7 dry, and chroma of 2 to 6 moist or dry. The horizon is silt loam or clay loam.

The Bt horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 3 to 5 moist and 4 to 7 dry, and chroma of 4 to 6 moist and 4 to 8 dry. The horizon is silty clay loam, silty clay, or clay. In some pedons, the lower part is as much as 50 percent soft, weathered rock fragments.

Wintley Series

The Wintley series consists of very deep, well drained soils on terraces. These soils formed in mixed alluvium. Slopes are 0 to 12 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Wintley silt loam, 0 to 12 percent slopes; 1,550 feet north and 85 feet east of the southwest corner of sec. 6, T. 21 S., R. 7 W.

Oi—2 inches to 0; slightly decomposed needles, leaves, twigs, mosses, and lichens.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, yellowish brown (10YR 5/4) dry; moderate fine and medium granular structure; soft, friable, sticky and plastic; many fine and medium roots and few coarse roots; many fine irregular pores; 10 percent gravel; very strongly acid; clear smooth boundary.

A2—4 to 10 inches; dark yellowish brown (10YR 3/4) silty clay loam, yellowish brown (10YR 5/4) dry; moderate fine and medium subangular blocky and granular structure; soft, friable, sticky and plastic; many fine and medium roots and few coarse roots; many very fine and fine tubular pores; 5 percent gravel; very strongly acid; clear smooth boundary.

BA—10 to 19 inches; dark brown (7.5YR 3/4) silty clay loam, strong brown (7.5YR 4/6) dry; moderate medium and coarse subangular blocky structure; slightly hard, firm, sticky and plastic; few medium roots; many very fine and fine tubular pores; very strongly acid; clear smooth boundary.

Bt1—19 to 35 inches; strong brown (7.5YR 4/6) silty clay loam, strong brown (7.5YR 5/6) dry; moderate medium and coarse subangular blocky structure; slightly hard, firm, sticky and plastic; few fine roots; many very fine and fine tubular pores; few faint clay films on faces of peds and in pores; very strongly acid; gradual smooth boundary.

Bt2—35 to 45 inches; strong brown (7.5YR 4/6) silty clay loam, strong brown (7.5YR 5/6) dry; moderate fine and medium subangular blocky structure; slightly hard, firm, sticky and plastic; few fine roots; many very fine and fine tubular pores; few faint clay films on faces of peds and in pores; very strongly acid; gradual smooth boundary.

Bt3—45 to 60 inches; strong brown (7.5YR 4/6) silty clay loam, strong brown (7.5YR 5/6) dry; weak medium and coarse subangular blocky structure; slightly hard, firm, sticky and plastic; many very fine and fine tubular pores; few faint clay films on faces of peds and in pores; very strongly acid.

Depth to bedrock is 60 inches or more. The profile has hue of 10YR or 7.5YR.

The A horizon has value of 3 or 4 moist and 4 or 5 dry, and it has chroma of 2 to 4 moist and 3 or 4 dry.

The BA horizon has value of 3 or 4 moist and 4 to 6 dry, and it has chroma of 4 to 6 moist or dry.

The Bt horizon has value of 4 or 5 moist and 4 to 6 dry, and it has chroma of 4 to 6 moist or dry. It is silty clay loam, silty clay, or clay.

The 2C horizon, where present, has colors similar to those of the Bt horizon. It is very gravelly loam, gravelly loam, or very gravelly sandy loam and is 25 to 45 percent rock fragments.

Wolfpeak Series

The Wolfpeak series consists of very deep, well drained soils on footslopes, side slopes, and ridges. These soils formed in colluvium and residuum derived from granodiorite. Slopes are 3 to 60 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of Wolfpeak sandy loam, 30 to 60 percent south slopes; 2,200 feet north and 2,300 west of the southeast corner of sec. 17, T. 29 S., R. 4 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) sandy loam, pale brown (10YR 6/3) dry; moderate fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots and few fine, medium, and coarse roots; many very fine irregular pores; 5 percent gravel; slightly acid; abrupt smooth boundary.

AB—3 to 8 inches; dark brown (7.5YR 4/4) sandy loam, light yellowish brown (10YR 6/4) dry; moderate very fine and fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots and few fine, medium, and coarse roots; many very fine tubular pores; 5 percent gravel; strongly acid; abrupt smooth boundary.

Bw—8 to 18 inches; strong brown (7.5YR 4/6) sandy loam, light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; hard, friable, nonsticky and nonplastic; common very fine roots and few fine, medium, and coarse roots; many very fine tubular pores; 5 percent gravel; strongly acid; clear wavy boundary.

Bt1—18 to 25 inches; strong brown (7.5YR 5/6) loam, pink (7.5YR 7/4) dry; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common very fine tubular pores; few faint clay films on faces of peds and in pores; 5 percent gravel; strongly acid; clear wavy boundary.

Bt2—25 to 48 inches; strong brown (7.5YR 5/6) loam, reddish yellow (7.5YR 7/6) dry; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common very fine tubular pores; common distinct clay films on faces of peds and in pores; 5 percent gravel; strongly acid; gradual wavy boundary.

Bt3—48 to 60 inches; strong brown (7.5YR 4/6) clay loam, reddish yellow (7.5YR 6/6) dry; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine tubular pores; common distinct clay films on faces of peds and in pores; 5 percent gravel; strongly acid.

Depth to bedrock is 60 inches or more.

The A and AB horizons have hue of 10YR or 7.5YR, value of 3 to 5 moist and 4 to 7 dry, and chroma of 2 to 4 moist or dry.

The Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 to 6 moist and 5 to 7 dry, and chroma of 4 to 8 moist or dry. The horizon is loam, clay loam, or gravelly clay loam.

Xanadu Series

The Xanadu series consists of very deep, well drained soils on broad ridges and side slopes. These soils formed in residuum and colluvium derived from sandstone and siltstone. Slopes are 3 to 60 percent. The mean annual precipitation is about 75 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Xanadu gravelly loam, 3 to 30 percent slopes; 2,460 feet south and 2,050 feet west of the northeast corner of sec. 1, T. 21 S., R. 6 W.

Oi—3 inches to 0; slightly decomposed needles, leaves, and twigs.

A1—0 to 4 inches; dark brown (7.5YR 3/2) gravelly loam, brown (7.5YR 5/4) dry; moderate very fine and fine granular structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many fine and medium irregular pores; common faint organic coatings on faces of peds and in pores; 30 percent gravel; moderately acid; clear smooth boundary.

A2—4 to 8 inches; dark brown (7.5YR 3/2) gravelly loam, brown (7.5YR 5/4) dry; moderate fine and medium granular structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many fine and medium irregular pores; few faint organic coatings on faces of peds and in pores; 30 percent gravel; moderately acid; clear smooth boundary.

BAt—8 to 15 inches; dark reddish brown (5YR 3/4) clay loam, yellowish red (5YR 5/6) dry; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots; common very fine and fine and few medium tubular pores; few faint clay films in pores; few faint organic coatings in pores and on faces of peds; 5 percent gravel; strongly acid; clear smooth boundary.

Bt1—15 to 28 inches; reddish brown (5YR 4/4) clay, yellowish red (5YR 5/6) dry; moderate medium and coarse subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots; common very fine and fine and few medium tubular pores; common faint clay films on faces of peds and in pores; 5 percent gravel; strongly acid; gradual smooth boundary.

Bt2—28 to 45 inches; dark red (2.5YR 3/6) clay, yellowish red (5YR 5/8) dry; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine tubular pores; common faint clay films on faces of peds and in pores; 5 percent gravel; strongly acid; gradual smooth boundary.

BCt—45 to 60 inches; dark red (2.5YR 3/6) clay, yellowish red (5YR 5/8) dry; weak medium and coarse subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine tubular pores; few faint clay films on faces of peds and in pores; 5 percent gravel; strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 7.5YR or 5YR, value of 2 or 3 moist and 3 to 5 dry, and chroma of 2 or 3 moist and 3 to 5 dry.

The BAt horizon has hue of 7.5YR or 5YR, value of 3 or 4 moist and 4 to 6 dry, and chroma of 3 to 6 moist or dry.

The Bt horizon has hue of 5YR or 2.5YR, value of 3 or 4 moist and 4 to 6 dry, and chroma of 4 to 6 moist and 4 to 8 dry.

Xerorthents

Xerorthents consists of well drained soils on side slopes. These soils formed in residuum and colluvium derived from a variety of parent material. Slopes are 30 to 80 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Reference pedon of Xerorthents in an area of Xerorthents-Rock outcrop complex, 30 to 80 percent slopes; 1,000 feet west and 150 feet south of the northeast corner of sec. 25, T. 26 S., R. 6 W.

A1—0 to 4 inches; dark brown (10YR 3/3) gravelly loam, brown (10YR 5/3) dry; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine continuous tubular pores; 25 percent gravel; moderately acid; clear smooth boundary.

A2—4 to 14 inches; dark yellowish brown (10YR 4/4) very cobbly clay loam, yellowish brown (10YR 5/4) dry; weak very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine continuous tubular pores; 40 percent cobbles; moderately acid; abrupt smooth boundary.

R—14 inches; basalt.

Depth to bedrock is 4 to 60 inches or more. These soils are clay loam to sandy loam and are 0 to 75 percent rock fragments.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 2 to 5 moist or dry, and chroma of 2 to 6 moist or dry.

Yachats Series

The Yachats series consists of very deep, well drained soils on flood plains. These soils formed in mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 80 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Yachats fine sandy loam, 0 to 3 percent slopes; 1,000 feet east and 100 feet south of the northwest corner of sec. 10, T. 21 S., R. 11 W.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; moderate very fine and fine granular structure; very soft, very friable, slightly sticky and nonplastic; many very fine and fine roots; many very fine and fine irregular pores; strongly acid; clear smooth boundary.

A2—5 to 12 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; moderate very fine and fine granular structure; very soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine irregular pores; strongly acid; clear smooth boundary.

Bw1—12 to 32 inches; dark brown (10YR 4/3) fine sandy loam, brown (10YR 5/3) dry; weak very fine and fine subangular blocky structure; very soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine tubular pores; strongly acid; clear smooth boundary.

Bw2—32 to 55 inches; dark brown (10YR 4/3) fine sandy loam, brown (10YR 5/3) dry; weak very fine and fine subangular blocky structure; very soft, very friable, slightly sticky and nonplastic; few very fine roots; common very fine tubular pores; strongly acid; abrupt wavy boundary.

C—55 to 60 inches; dark brown (10YR 4/3) sand, light yellowish brown (10YR 6/4) dry; single grain; loose, nonsticky and nonplastic; common fine and medium irregular pores; strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has value of 2 or 3 moist and 4 or 5 dry, and it has chroma of 2 or 3 moist or dry.

The Bw horizon has value of 4 or 5 moist and chroma of 3 or 4 moist or dry. It is loam or fine sandy loam.

The C horizon has value of 4 or 5 moist and 5 or 6 dry, and it has chroma of 3 or 4 moist or dry. It is sand or loamy fine sand.

Yoncalla Series

The Yoncalla series consists of very deep, somewhat poorly drained soils on toeslopes, footslopes, and alluvial fans. These soils formed in colluvium derived from basalt. Slopes are 2 to 30 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Yoncalla silty clay loam, 2 to 20 percent slopes; 1,400 feet west and 1,815 feet south of the northeast corner of sec. 22, T. 23 S., R. 5 W.

A—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark brown (10YR 4/3) dry; moderate medium and coarse subangular blocky structure parting to moderate medium and coarse granular; very hard, firm, sticky and plastic; many very fine and fine roots and common medium roots; many very fine and fine irregular pores; 5 percent gravel; strongly acid; gradual smooth boundary.

Bw—8 to 15 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 5/3) dry; moderate medium and coarse subangular blocky structure; very hard, firm, sticky and very plastic; many very fine and fine roots and few medium roots; many very fine and fine irregular and tubular pores; 5 percent gravel; strongly acid; abrupt smooth boundary.

2Bt1—15 to 31 inches; brown (10YR 4/3) clay, brown (10YR 5/3) dry; common fine distinct gray (10YR 5/1) and strong brown (7.5YR 5/6) mottles; moderate coarse angular blocky structure; extremely hard, very firm, very sticky and very plastic; few fine roots; few very fine and fine tubular pores; common distinct clay films on faces of peds and in pores; 10 percent gravel; 5 percent manganese concretions 1 to 2 millimeters in diameter; moderately acid; gradual smooth boundary.

2Bt2—31 to 49 inches; brown (10YR 4/3) clay, brown (10YR 5/3) dry; common fine faint gray (10YR 5/1) and strong brown (7.5YR 5/6) mottles; moderate coarse angular blocky structure; extremely hard, very firm, very sticky and very plastic; few very fine and fine tubular pores; many prominent clay films on faces of peds and in pores; 10 percent hard gravel and 5 percent soft gravel; slightly acid; abrupt smooth boundary.

2Bt3—49 to 60 inches; brown (10YR 4/3) gravelly clay, brown (10YR 5/3) dry; few fine distinct dark gray (10YR 4/1) mottles and few faint strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; extremely hard, firm, sticky and plastic; few very fine tubular pores; common distinct clay films on faces of peds and in pores; 30 percent hard gravel and 15 percent soft gravel; slightly acid.

Depth to bedrock is 60 inches or more. Thickness of the mollic epipedon and depth to the 2Bt horizon are 12 to 20 inches.

The A and Bw horizons have value of 2 or 3 moist and 4 or 5 dry, and they have chroma of 2 or 3 dry.

The 2Bt horizon has hue of 2.5Y or 10YR, value of 4 or 5 moist and 4 to 6 dry, and chroma of 1 to 4 moist or dry. The lower part of the horizon is clay or gravelly clay.

Zalea Series

The Zalea series consists of moderately deep, well drained soils on ridges. These soils formed in colluvium and residuum derived from metamorphic rock. Slopes are 15 to 30 percent. The mean annual precipitation is about 90 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of Zalea gravelly loam in an area of Zalea-Pyrady complex, 15 to 30 percent slopes; 2,200 feet south and 1,800 feet east of the northwest corner of sec. 13, T. 37 S., R. 13 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, twigs, and woody material.

A1—0 to 4 inches; dark brown (10YR 4/3) gravelly loam, yellowish brown (10YR 5/4) dry; moderate very fine and fine subangular blocky structure; soft, very friable, nonsticky and slightly plastic; many very fine and fine roots and common medium roots; many fine tubular pores;

15 percent gravel; very strongly acid; clear wavy boundary.

A2—4 to 8 inches; dark brown (10YR 4/3) gravelly loam, light yellowish brown (10YR 6/4) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots, common medium roots, and few coarse roots; many fine tubular pores; 15 percent gravel; very strongly acid; clear wavy boundary.

Bt1—8 to 16 inches; dark yellowish brown (10YR 4/4) gravelly clay loam, yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; many fine and medium roots and few coarse roots; many very fine tubular pores; few distinct clay films on faces of peds and in pores; 20 percent gravel and 15 percent soft rock fragments; very strongly acid; clear wavy boundary.

Bt2—16 to 31 inches; light olive brown (2.5Y 5/4) gravelly clay loam, light yellowish brown (2.5Y 6/4) dry; moderate medium angular blocky structure; hard, firm, sticky and plastic; few coarse roots; many very fine tubular pores; common distinct clay films on faces of peds and in pores; 20 percent gravel and 25 percent soft rock fragments; very strongly acid; clear wavy boundary.

Bt3—31 to 34 inches; light olive brown (2.5Y 5/4) gravelly clay loam, light yellowish brown (2.5Y 6/4) dry; moderate coarse angular blocky structure; hard, firm, sticky and plastic; few coarse roots; many very fine tubular pores; many distinct clay films on faces of peds and in pores; 20 percent gravel, 3 percent cobbles, and 30 percent soft rock fragments; very strongly acid; abrupt wavy boundary.

R—34 inches; siltstone.

Depth to bedrock is 20 to 40 inches.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 moist and 5 or 6 dry, and chroma of 2 or 3 moist and 4 to 6 dry.

The Bt horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 4 or 5 moist and 5 or 6 dry, and chroma of 4 to 6 moist or dry.

Zing Series

The Zing series consists of very deep, somewhat poorly drained soils on footslopes and side slopes and in swales. These soils formed in residuum and colluvium derived from granodiorite, volcanic rock, and metamorphic rock. Slopes are 0 to 45 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Zing loam in an area of Zing-Sweetbriar complex, 30 to 60 percent slopes; 80 feet east and 2,000 feet north of the southwest corner of sec. 36, T. 28 S., R. 3 W.

Oi—1 inch to 0; slightly decomposed needles, leaves, and twigs.

A—0 to 7 inches; dark brown (7.5YR 3/2) loam, brown (7.5YR 4/2) dry; strong very fine, fine, and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; many very fine irregular pores; strongly acid; clear wavy boundary.

BA—7 to 10 inches; dark brown (7.5YR 3/4) clay loam, brown (7.5YR 5/4) dry; moderate very fine and fine subangular blocky structure; hard, firm, very sticky and plastic; common very fine, fine, medium, and coarse roots; many very fine irregular pores; strongly acid; clear wavy boundary.

2Bt—10 to 17 inches; dark yellowish brown (10YR 4/6) clay, yellowish brown (10YR 5/4) dry; few fine prominent yellowish red (5YR 5/8) mottles; moderate fine and medium subangular blocky structure; very hard, very firm, very sticky and plastic; common very fine, fine, and medium roots; many very fine tubular pores; common distinct clay films on faces of peds and in pores; strongly acid; abrupt wavy boundary.

2Btg1—17 to 24 inches; gray (5Y 6/1) clay, gray (5Y 6/1) dry; common medium yellowish red (5YR 4/6 and 5YR 5/8) mottles; moderate medium and coarse subangular blocky structure; very hard, firm, very sticky and plastic; common very fine, fine, and medium roots; many very fine tubular pores; common distinct clay films on faces of peds and in pores; strongly acid; abrupt wavy boundary.

2Btg2—24 to 36 inches; gray (5Y 5/1) clay, light gray (5Y 6/1) dry; common medium prominent yellowish red (5YR 4/6) mottles, yellowish red (5YR 5/8) dry; moderate medium and coarse subangular blocky structure; very hard, firm, very sticky and plastic; common very fine, fine, and medium roots; many very fine tubular pores; few distinct clay films on faces of peds and in pores; strongly acid; abrupt wavy boundary.

2BCt1—36 to 45 inches; gray (5Y 6/1) clay, light gray

(5Y 6/1) dry; many medium yellowish red (5YR 4/6) and strong brown (7.5YR 5/8) mottles; weak medium and coarse subangular blocky structure; hard, firm, very sticky and plastic; common very fine and fine roots; common very fine tubular pores; few distinct clay films on faces of peds and in pores; strongly acid; clear wavy boundary.

2BCt2—45 to 62 inches; light olive gray (5Y 6/2) clay, light gray (5Y 7/1) dry; many medium yellowish red (5YR 4/6) mottles; weak medium and coarse subangular blocky structure; hard, firm, very sticky and plastic; few very fine roots; common very fine tubular pores; few distinct clay films on faces of peds and in pores; strongly acid.

Depth to bedrock is 60 inches or more. Mottles that are a result of wetness are at a depth of 10 to 30 inches.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 moist and 4 or 5 dry, and chroma of 2 or 3 moist or dry.

The BA horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 3 or 4 moist and 4 to 6 dry, and chroma of 2 to 4 moist or dry. The horizon is loam, clay loam, or silty clay loam.

The Bt horizon has hue of 5Y, 2.5Y, or 10YR, value of 4 or 5 moist and 6 or 7 dry, and chroma of 1 to 4 moist or dry. The horizon is clay loam, silty clay loam, or clay.

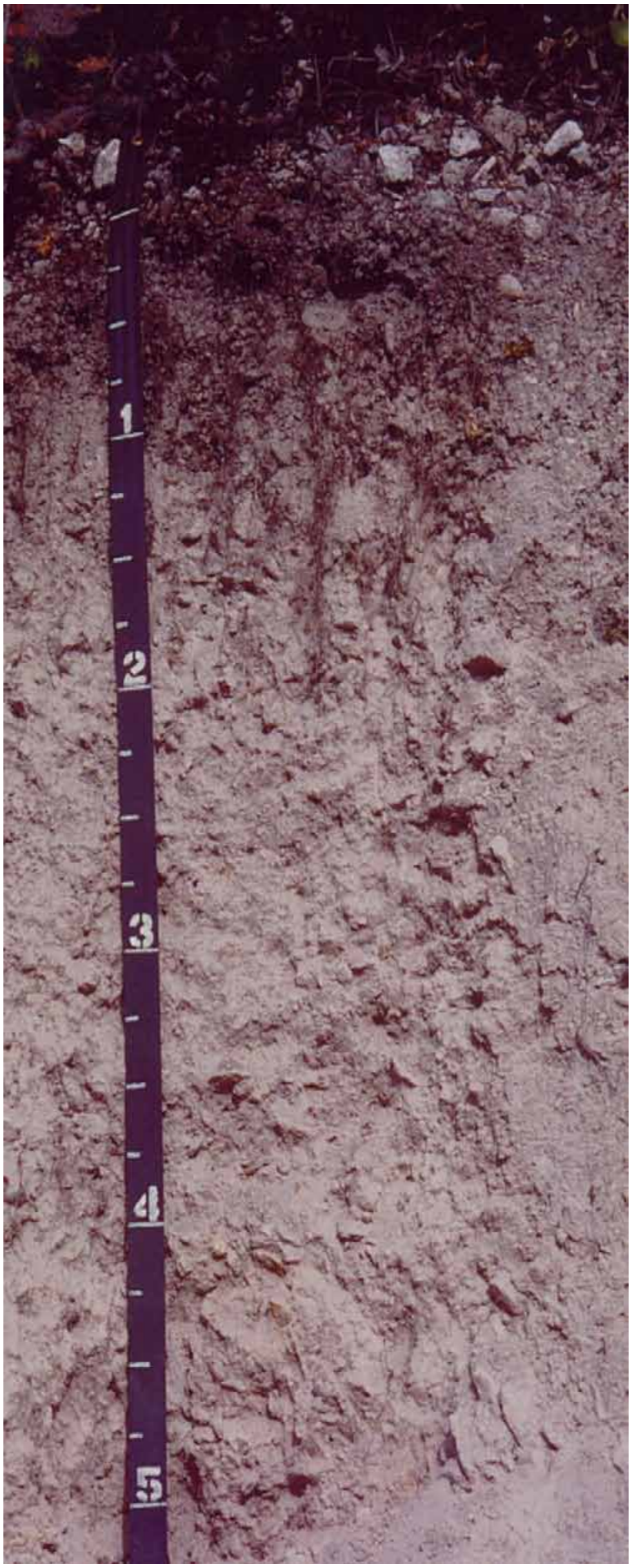


Figure 17.—Typical profile of Chamate extremely gravelly loam, 30 to 60 percent slopes.

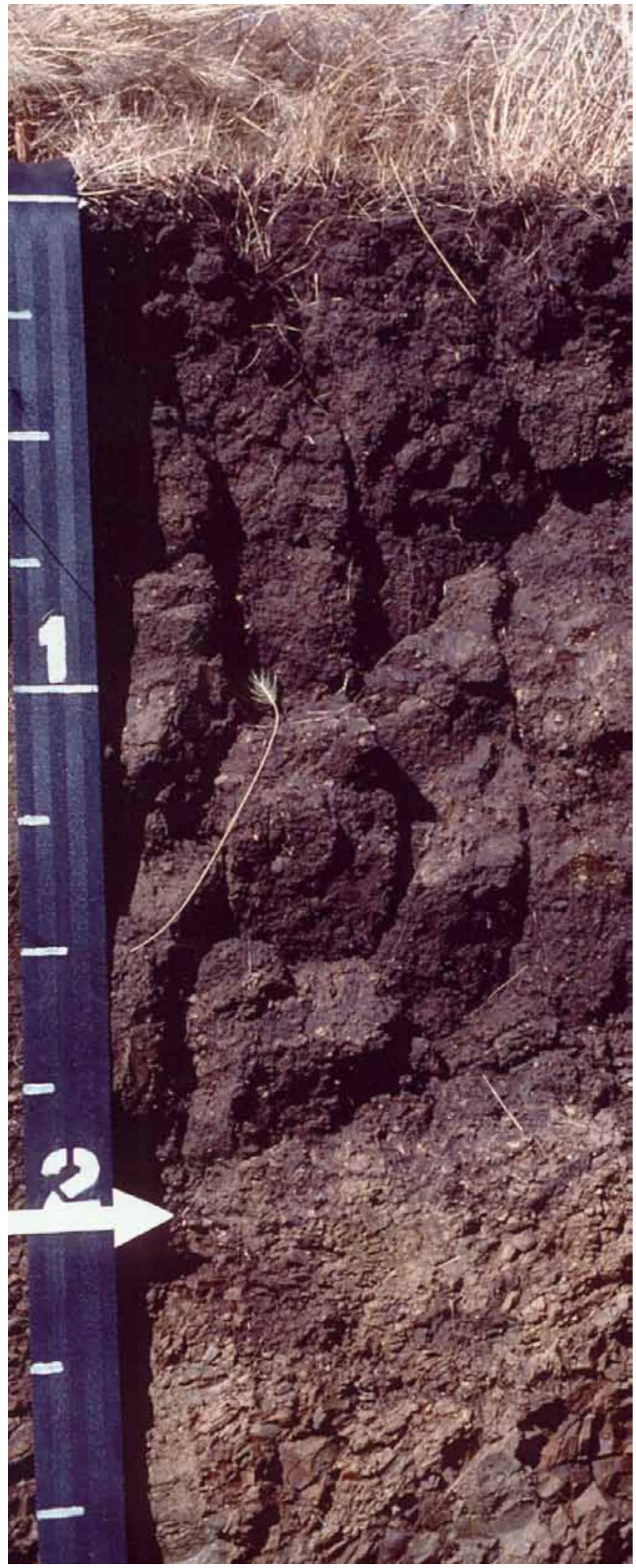


Figure 18.—Profile of a Climax soil. A lithic contact is at a depth of about 24 inches.

Figure 19.—Profile of a Conser soil. The water table is at a depth of 60 inches. The A horizon extends from the surface to a depth of 7 inches. The B horizon is at a depth of 7 inches and extends to a depth of 20 inches.

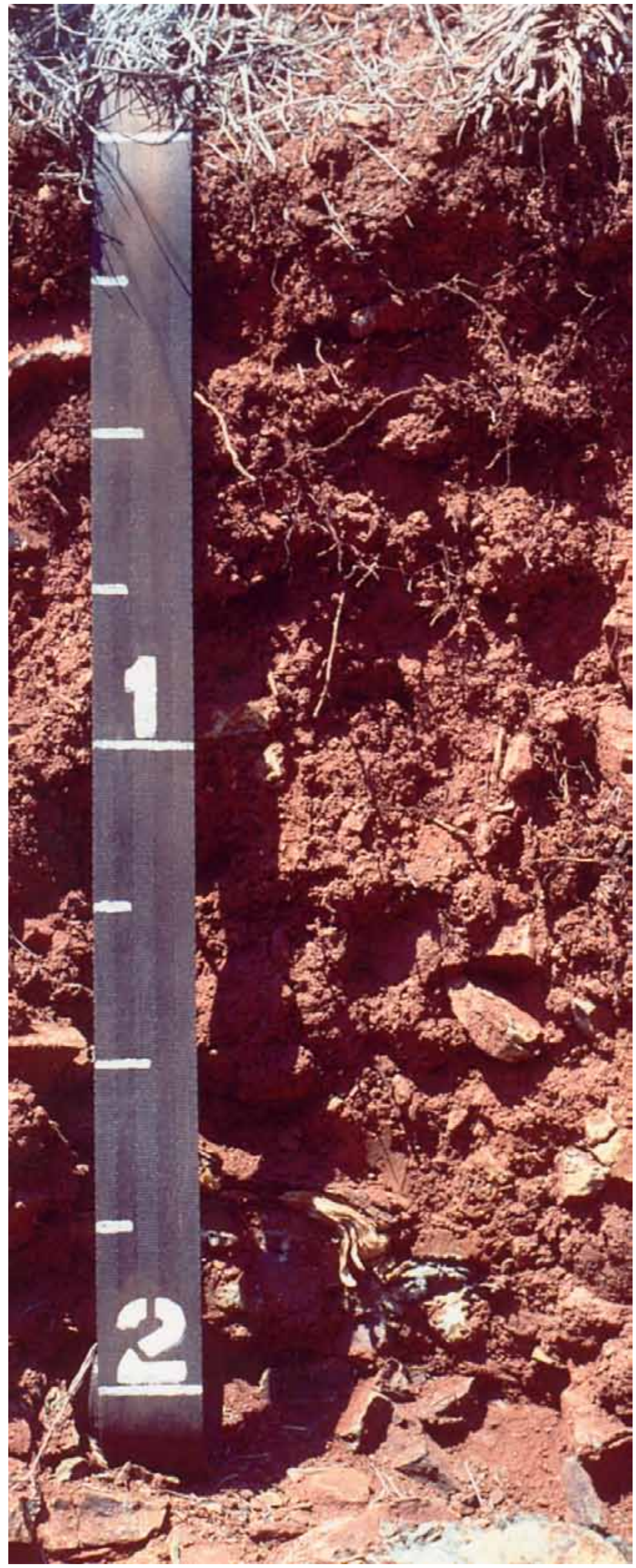


Figure 20.—Profile of a Dubakella soil. A lithic contact is at a depth of about 24 inches.

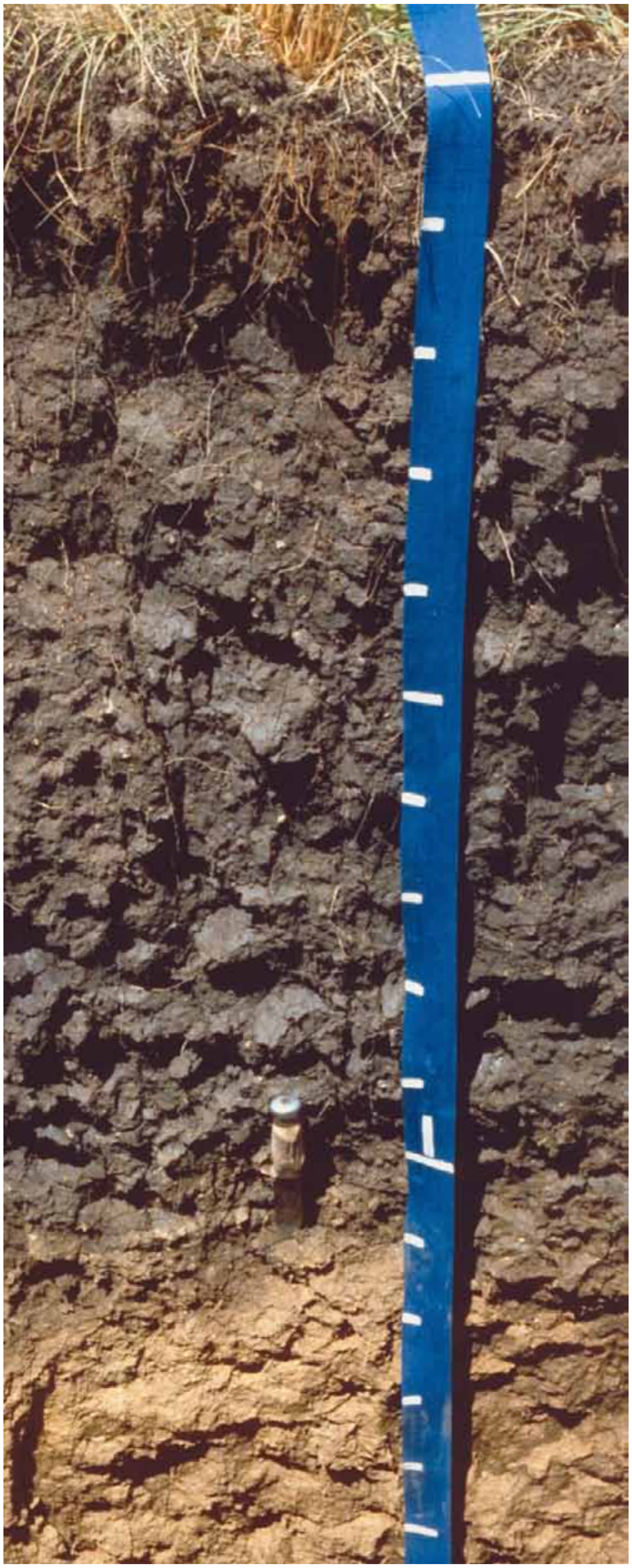


Figure 21.—Typical profile of Natroy clay, 0 to 2 percent slopes. The lithologic discontinuity is at a depth of 40 inches (1 meter). Tape is marked at 10-centimeter increments.

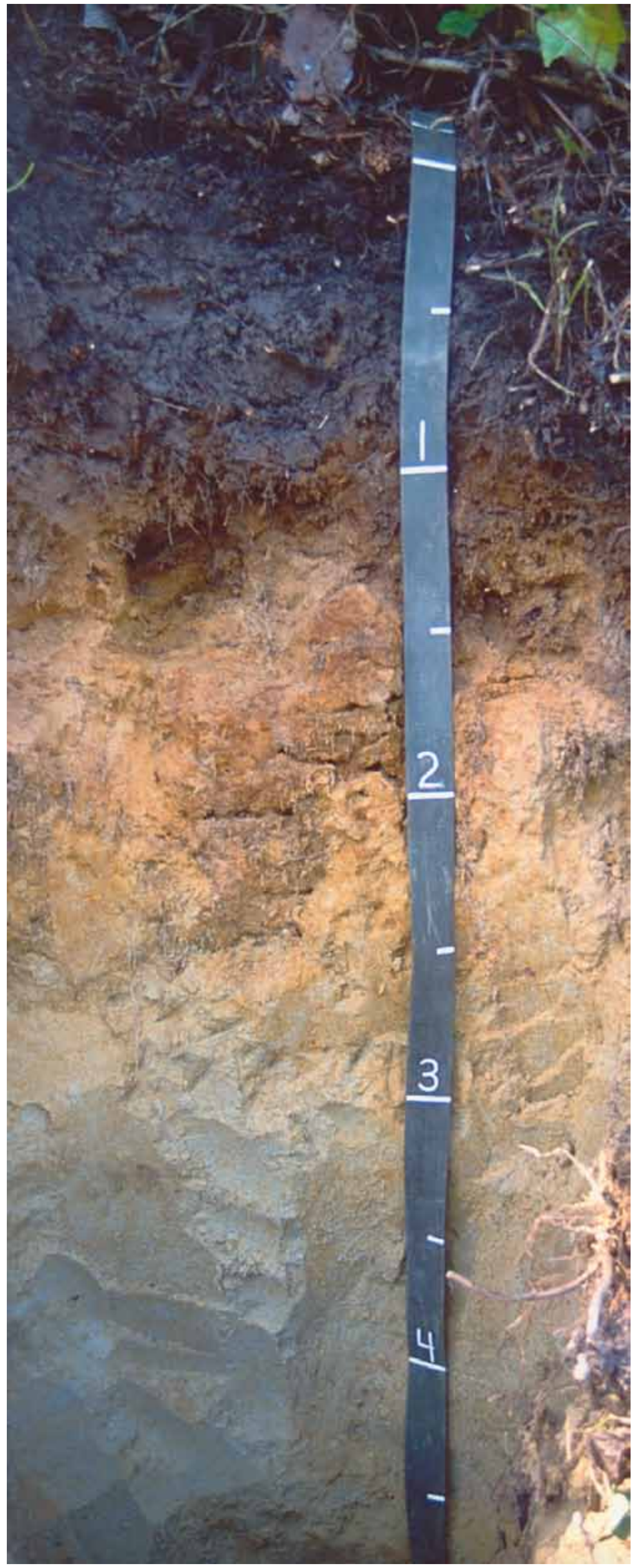


Figure 22.—Profile of a Netarts soil. The E horizon extends from the surface to a depth of 10 inches. The Bs horizon is at a depth of 10 inches and extends to a depth of 36 inches.

Figure 23.—Profile of a Packard soil. The dark-colored mollic epipedon extends from the surface to a depth of about 24 inches.

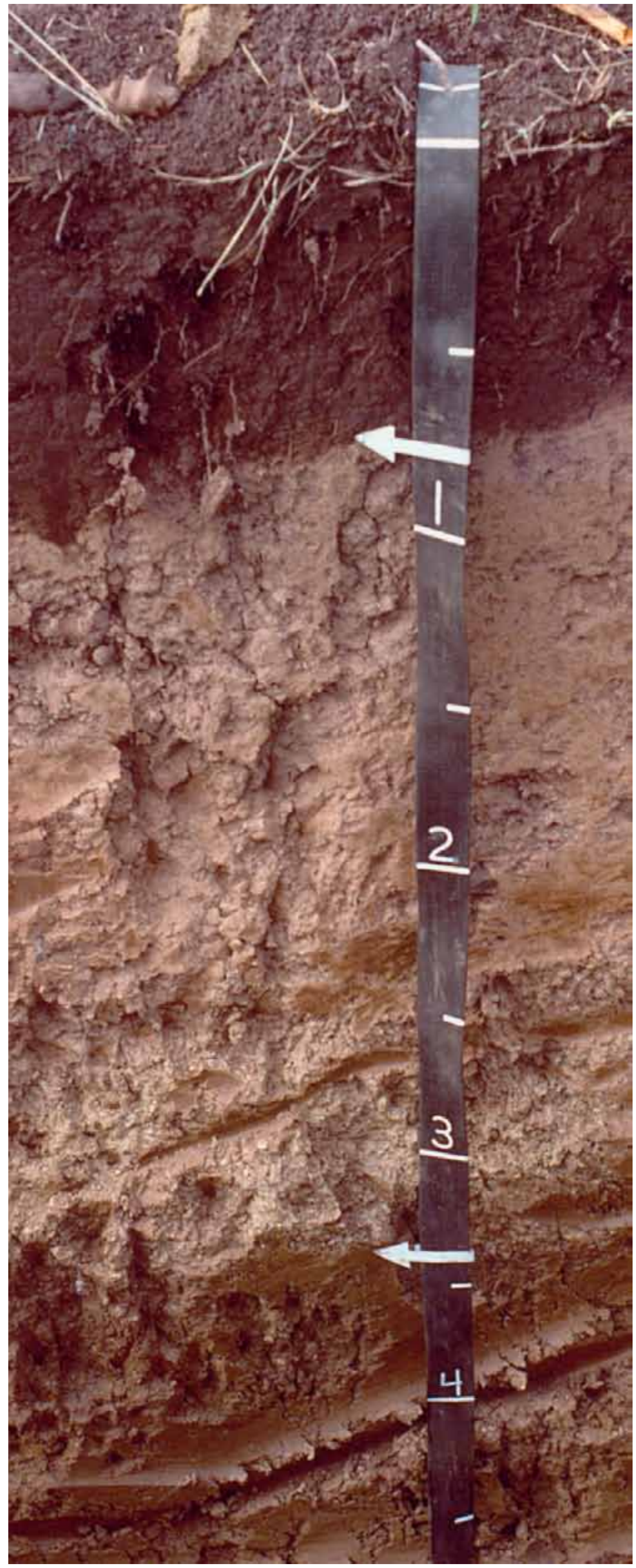


Figure 24.—Profile of a Sutherlin soil. The A horizon extends from the surface to a depth of 10 inches. The Bt horizon is at a depth of 10 inches and is underlain by the 2C horizon at a depth of 40 inches.

Formation of the Soils

Frank F. Reckendorf, sedimentation geologist, Natural Resources Conservation Service, helped to prepare this section.

In this section, the factors that influence the formation of soil are defined and soil development within the six geographic areas in the survey area is discussed. The geographic areas are the Coastal Lowlands and Mountains, Interior Valley Lowlands, Interior Mountains, Klamath Mountains, Coast Range Mountains, and Western Cascade Mountains (see figure 1, page 22).

Factors of Soil Formation

Soil is the earth's outermost layer. It is a collection of natural bodies that supports or is capable of supporting plants. Soils form when climatic and biological forces physically and chemically alter parent material. Parent material can be organic accumulations or geologic material such as granite, volcanic ash, peat, dunes, or alluvium. Relief and time influence the rate of soil formation. Climate, biological activity, parent material, relief, and time are known by soil scientists as the five soil-forming factors.

Climate

Climate is a very important soil-forming factor. Temperature and precipitation constantly alter the physical and chemical makeup of parent material to form soil. Temperature affects the rate of weathering of parent material—ice wedges fracture rock, cold temperatures inhibit biological activity, and warm temperatures enhance oxidation, reduction, and hydrolysis. Precipitation results in translocation of clay and minerals within soil, leaching of carbonates and bases from soil, weathering of parent material, and deposition of alluvium. Precipitation is required for chemical reactions such as oxidation, reduction, and hydrolysis (Buol and others, 1980).

Climate in the survey area is highly variable. Rainfall ranges from 60 to 90 inches in the udic moisture regime along the Pacific Coast to 35 to 60 inches in the xeric moisture regime of the interior valleys. Temperature ranges from the isomesic temperature regime along the coast to the frigid and cryic temperature regimes of the high-elevation mountains. Most of the soils in the survey area, except the late Holocene alluvial deposits along streams, are leached of bases and carbonates.

Biological Activity

Biological activity that affects soil formation in the survey area can be grouped into two vegetative areas—the forested regions and the interior valleys of Western Oregon (Franklin and Dyrness, 1973).

The forested regions in the survey area support dominantly conifer species. The soils in these regions typically are acidic and low in bases and carbonates, and they have a layer of duff on the surface. Soil microbes contribute to the acidic conditions; fungal mats beneath the layer of duff and mycorrhiza associated with many plant roots liberate nutrients for forest plants, creating acids as a by-product. Bacteria oxidize minerals, transform heavy metals, and convert organic carbon to humus. Acids, which benefit forest plants, are also a by-product of these processes. Arthropods convert organic carbon to humus, which helps to create soil structure. Natural activity, such as plant roots fracturing and loosening bedrock, trees falling, burrowing animals mixing the layer of duff with the mineral soil material, and animals trampling the soil surface, draws humus down into the soil, improving soil aeration and structure. Earthworms, which are limited by the acidic conditions, contribute to a lesser degree to the formation of soils in coniferous forests by mixing organic matter with mineral matter (Pritchett, 1979). Most of the forested soils are Alfisols, Ultisols, Inceptisols, and Andisols.

The interior valleys, consisting of flood plains, river terraces, footslopes, and low-elevation hill slopes, support dominantly grassland and oak savannah vegetation with scattered conifer forests (fig. 25). Soil formation processes in areas of grassland consist

Figure 25.—Typical vegetation of the interior valleys. Oakland soils support oak savannah, and Nonpareil soils support grassland.

dominantly of organic matter accumulating at the soil surface as a result of the annual cycling of dying grass roots. The resulting dark color and high base status extends down into the soil as a result of the reworking of the soil and organic matter by earthworms, ants, and moles and other rodents (Buol and others, 1980). Most of the grassland soils are Mollisols. Biological activity in areas of oak woodland is similar to that in areas of conifer forests, but the soils that support deciduous forests have more bases because the litter from the deciduous leaves provides bases that are cycled into the soil annually (Pritchett, 1979).

Parent Material

Parent material consists of consolidated and unconsolidated material derived from rocks and organic matter accumulations. The chemical and mineralogical characteristics of soils are inherited from the parent material. The section "General Nature of the Survey Area" provides more information on the geology of the survey area.

The soils in the survey area formed in coastal eolian dunes, deep organic accumulations, old alluvium on marine terraces and river terraces, recent alluvium on flood plains, residuum and colluvium derived from granodiorite, serpentine, schist, basalt, volcanic breccia, flow tuff, sandstone, siltstone, and conglomerate (Ramp, 1972). Examples of soil orders and suborders on various kinds of parent material are Psamments that formed in vegetated, stabilized coastal dunes deposited by offshore winds; Histosols that formed in deep organic accumulations along the coast, in interdunal areas; Spodosols that formed on the sandy lower marine terraces; and Andisols and Ultisols that formed on the loamy higher marine terraces. Soils that formed in residuum in the mountains vary according to the parent material, but most are Inceptisols, Alfisols, and Ultisols. An exception is Andisols that formed in residuum and colluvium at the high elevations. Most of the alluvial soils in the survey areas are Mollisols derived from mixed sources. Exceptions are a small acreage of Andisols derived from ash originating from the prehistoric eruption of Mt. Mazama in the Cascades, serpentinitic Mollisols originating from serpentine uplands, and Vertisols originating from volcanic uplands.

Relief

Relief, consisting of the aspect, shape, and grade of a slope, can enhance or inhibit the rate of soil formation by affecting evaporation, erosion, temperature, and internal soil drainage.

The aspect of a slope affects soil-forming factors such as biological activity and climate. On south- and southwest-facing slopes, intense solar radiation increases evaporation and soil temperature, but on north-facing slopes, the soils remain moist into summer. Commonly, soils on south-facing slopes are shallower than those on adjacent north-facing slopes (particularly in the Interior Lowlands and Klamath Mountains). Most shallow soils that support grassland are on south-facing slopes, and soils on north-facing slopes commonly have a thicker layer of duff on the forest floor.

The shape of a slope also affects soil formation. In concave positions, such as swales, a perched water table results in cool temperatures and anaerobic conditions, slowing down biological activity and inhibiting soil formation. In nearly level and convex areas, however, the soils are well drained and soil formation is unimpeded.

Finally, the grade of a slope affects soil formation. The very steep and steep slopes of the mountains, hills, headwalls, and escarpments are called active and metastable slopes. On these slopes, events such as rockfalls, sloughing, slumping, and raveling continually remove and mix parent material and soil material and restrict soil development. Soils on these slopes develop only a cambic horizon and are only partially leached of bases and carbonates. The moderate, gentle, and nearly level slopes on broad ridges and plateaus are called stable slopes (Parsons, 1978). The soils on these slopes stay in place long enough to develop an argillic horizon and an umbric or mollic epipedon, and they are partially or nearly completely leached of bases and carbonates.

Time

Time is needed for weathering of parent material and development of diagnostic soil characteristics. The longer period of time a landform is stationary, the greater the opportunity for a soil on the landform to develop characteristics that exhibit the effects of the other soil-forming factors. The effect of time on the development of an argillic horizon is illustrated by comparing landforms of differing ages. The Ingram geomorphic surface, a low flood plain, is estimated to be about 555 years old (plus or minus 100 years) to 3,290 years old (plus or minus 120 years) (Balster and Parsons, 1966). The Newberg soils (Haploxerolls) on the Ingram surface do not have diagnostic subsoil horizons. The Winkle geomorphic surface, an abandoned flood plain, is about 5,250 years old (plus or minus 270 years) (Reckendorf and Parsons, 1966). The Coburg soils (Argixerolls) on the Winkle surface have an argillic horizon. The Eola geomorphic surface, a stable pediment remnant, is estimated to be at least 9,570 years old (Balster and Parsons, 1966). The Jory soils (Palehumults) on the Eola surface have strong argillic development.

The effect of time on soil formation is also exhibited by the base saturation. The base saturation level of the soils in the Willamette Valley decreases as the age of the landform increases, indicating leaching in the older soils (Parsons and others, 1970).

Soil Development

The principles of geomorphology were used by field soil scientists during this survey. Some reconnaissance studies have been done on the relationship of the soils in the survey area to geomorphic surfaces (Reckendorf, 1987). Correlations have been made between landforms in the survey area and geomorphic surfaces in the survey areas immediately surrounding it. These include studies of the Willamette Valley (Balster and Parsons, 1968; Reckendorf, 1992; Parsons, 1978; Parsons and others, 1973), the coast of southern Oregon (Nettleton and others, 1982), the entire Oregon coast

(Reckendorf, 1975), the Pioneer surface along the Oregon coast (Patching, 1984), and the Upper Rogue Valley (Parsons and Herriman, 1976).

In the following paragraphs, soil development in the six geographic areas in the survey area is discussed. The characteristics of the major soils in each of the geographic areas are summarized in the chart at the end of this section.

Coastal Lowlands and Mountains

This area encompasses the westernmost part of the survey area. Along the Pacific Ocean, parent material has the strongest influence on soil formation, with Psamments forming in the eolian sand dunes. Climate is the most important soil-forming factor inland because of the presence of moist marine air year round. The inland soils are leached of bases, support upland coniferous forests that produce a thick layer of duff, and have sufficient organic matter to form Humitropepts. Fulvudands form in areas where the rock is of volcanic origin. Geomorphic surfaces recognized along the ocean are the Horseshoe, Ingram, Whiskey Run, and Pioneer surfaces (Nettleton and others, 1982), and those of the adjacent inland areas are the Horseshoe, Ingram, Winkle, and Dolph surfaces. The mountains in this geographic area are in the Looney geomorphic unit, which is a composite of stable, metastable, and active slopes too small to be mapped individually (Balster and Parsons, 1968).

Interior Valley Lowlands

This area includes the flood plains, terraces, alluvial fans, and hills in the central part of the survey area. The native vegetation is grassland and oak savannah with some conifer trees. The summers are hot and dry, and the winters are cool and wet. As a result, all of the soils in this area are partially leached of bases, most of the soils have had some translocation of clay, and many of the soils have a mollic epipedon. Haploxerolls formed on the alluvial flood plains, Argixerolls formed on the terraces and on the hills derived from metamorphic basalt, Haploxeralfs formed on the hills and alluvial fans derived from sedimentary rock, very shallow Xerorthents and shallow Xerochrepts formed on the south-facing hills derived from sedimentary rock, and Haploxererts formed on the alluvial fans derived from basalt. In this part of the survey area, the south-facing slopes are droughty and the soils on these slopes commonly are shallower than those on the adjacent north-facing slopes. Geomorphic surfaces in this area are the Horseshoe, Ingram, Luckiamute, Winkle, Senecal, Camp, Dolph, and Eola surfaces (fig. 26). The Camp surface, which has been identified near Days Creek, was

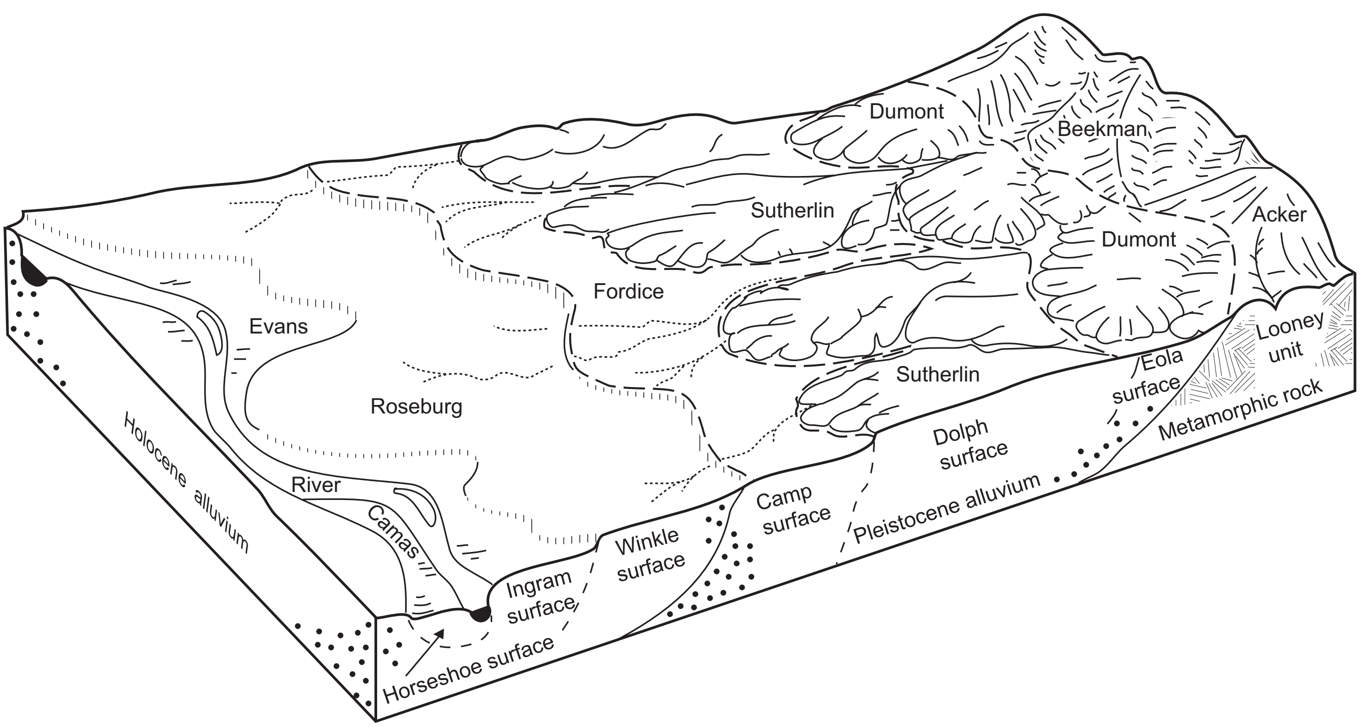


Figure 26.—Cross section of the South Umpqua Valley showing the relationship of the soils to the geomorphic surfaces.

recognized as unique to the survey area (fig. 27) (Reckendorf, 1987).

Coast Range Mountains

This area encompasses the western part of the survey area. The soils formed in residuum and colluvium derived from sedimentary and igneous rock. Climate is the dominant soil-forming factor in this area because of the presence of moist marine air year round. The soils are leached of bases, support upland coniferous forests that produce a thick layer of duff, and have sufficient organic matter to form Humults on the gentle and moderate slopes and Haplumbrepts and Dystrochrepts on the steep and very steep slopes. Hapludands form at the high elevations in areas where the bedrock is of volcanic origin. The Coast Range Mountains are in the Looney geomorphic unit. Extensive areas of stable surfaces in this geographic area are on the Eola geomorphic surface.

Interior Mountains

This area encompasses the mountains in the central part of the survey area. The soils formed in residuum and colluvium derived from sedimentary and igneous rock. The natural vegetation is coniferous forests, but some areas have been converted to pasture and hay, cropland, or tree farms. The summers are hot and dry, and the winters are cool and wet. All of the soils in this area are partially leached of bases. On the stable landforms, such as the broad ridges and plateaus, translocation of clay has taken place in the soils, the coniferous forests have produced a thick layer of duff, and the soils have

Figure 27.—Coburg soils on the Winkle surface in foreground, Pengra soils on the Camp surface in center, and Josephine soils on the Looney unit in background.

sufficient organic matter to form Humults. Haploxeralfs have formed on the metastable mountainsides, and Dystric Xerochrepts have formed on the active mountainsides. The Interior Mountains are in the Looney geomorphic unit. Extensive areas of stable surfaces in this geographic area are included in the Eola geomorphic surface.

Klamath Mountains

This area encompasses the southern part of the survey area. The soils formed in residuum and colluvium derived from metamorphic sedimentary and igneous rock, granite, and serpentine. The summers are hot and dry, and the winters are cool and wet. All of the soils are partially leached of bases. The natural vegetation is coniferous forests with some native grassland on south-facing slopes. Palexerults and Haploxeralfs formed in the forested areas on the stable landforms, such as broad ridges and plateaus, and on metastable side slopes. Xerochrepts formed on the active hillsides and mountainsides and on south-facing side slopes. The soils on the south-facing slopes are shallow and are underlain by sedimentary rock. Haploxerolls formed in areas of native grassland and in areas of dark-colored parent material, such as metamorphic basalt and schist. In this part of the survey area, relief greatly influences soil formation. Soils on south-facing slopes commonly are shallower than those on adjacent north-facing slopes, and most shallow soils that support grassland are on south-facing slopes. The Klamath Mountains are in the Looney geomorphic unit.

Western Cascade Mountains

This area encompasses the eastern part of the survey area. The soils formed in residuum and colluvium derived from basalt, andesite, andesitic agglomerate, welded tuff, and ashflow tuff. The area is dominated by a relatively cool, moist montane climate. The soils are leached of bases, support upland coniferous forests that produce a thick layer of duff, and have sufficient organic matter to form Humults on the gentle and moderate slopes and Umbrepts on the steep and very steep slopes. Udands and Cryands form at the high elevations. The Western Cascade Mountains are in the Looney geomorphic unit. Extensive areas of stable surfaces in this geographic area are on the Eola geomorphic surface.

Formation of the Soils

Geomorphic surface	Landform and landscape position	Stratigraphy	Series	Classification	Comments ("active, metastable," and "stable" are used to describe slopes in the Looney unit)
SOILS OF THE COASTAL LOWLANDS AND MOUNTAINS					
Horseshoe (Marine)	Active foredune	Duneland			
	Interdunal swale	Eolian material	Heceta	Typic Psammaquents	Wind has stripped sand to water table
Ingram (Marine)	Recently stabilized dune	Eolian sand	Waldport	Typic Tropopsamments	
	Low flood plain	Recent alluvium	Coquille	Aeric Tropic Fluvaquents	Daily tidal influence or annual flooding
	Low tidal basin and flood plain	Decomposed, fibrous organic deposits	Bragton	Sapric Terric Tropohemists	Perennial high water table
Whiskey Run (Marine)	Low marine terrace, stabilized dune	Eolian sand	Netarts	Entic Haplorthods	Old stables dunes
Pioneer (Marine)	High marine terrace	Sandy and silty alluvium	Lint	Alic Fulvudands	Alluvial terraces mantled with medial silts of eolian origin; only remnants of this terrace remain
Ingram (Inland)	Intermediate flood plain	Recent to Holocene alluvium	Kirkendall	Fluventic Haplumbrepts	
			Quosatana	Fluvaquentic Humaquepts	In concave positions
Winkle (Inland)	Alluvial fan and terrace		Meda	Typic Haplumbrepts	Umbric epipedon, cambic horizon
Eola (Inland)	High terrace	Middle Pleistocene alluvium	Wintley	Typic Haplohumults	Umbric epipedon, argillic horizon
Looney unit	Mountain side slope	Sandstone and siltstone colluvium and residuum	Salander	Alic Fulvudands	Andic because of parent material and high organic carbon content
		Sandstone and siltstone colluvium	Templeton	Andic Humitropepts	Weak andic because of parent material and high organic carbon content
	Mountain ridge and side slope	Sandstone colluvium	Reedsport	Typic Humitropepts	

Formation of the Soils--Continued

Geomorphic surface	Landform and landscape position	Stratigraphy	Series	Classification	Comments ("active, metastable," and "stable" are used to describe slopes in the Looney unit)
SOILS OF THE INTERIOR VALLEY LOWLANDS					
Horseshoe	Low flood plain	Recent, mostly coarse alluvium	Camas	Fluventic Haploxerolls	If vegetated, may have mollic epipedon
Ingram	Low flood plain	Recent to Holocene alluvium	Newberg	Fluventic Haploxerolls	
	Intermediate flood plain		Evans	Cumulic Haploxerolls	Thick mollic epipedon
Luckiamute	Intermediate flood plain	Clayey alluvium	Waldo	Fluvaqentic Endoaquolls	Planar to bar and channel; mineralogy of local area; correlates to Horseshoe, Ingram, or Winkle within Dolph, Eola, and Looney units
	High flood plain		Sibold	Aquultic Argixerolls	
Winkle	Intermediate flood plain		Chapman	Cumulic Ultic Haploxerolls	Cambic horizon
			Waldo	Fluvaquentic Endoaquolls	Back swamps and depressions
	High flood plain		Roseburg	Pachic Ultic Argixerolls	Argillic horizon
			Glide	Humic Vitrixerands	Mt. Mazama ash influence
Senecal	Low stream terrace	Clayey alluvium	Conser	Typic Argiaquolls	Ponding
	Terrace and alluvial fan	Mixed alluvium	Medford	Pachic Argixerolls	
			Foehlin	Typic Argixerolls	
Camp	High stream terrace	Gravelly and cobbly alluvium	Fordice	Ultic Argixerolls	Middle Pleistocene; may be glacial till
		Slope alluvium and colluvium over old alluvium	Pengra	Typic Epiaquolls	Clay at 12-20 inches; may be glacial till
			Sutherlin	Ultic Haploxeralfs	Clay at 20-26 inches; may be glacial till

Formation of the Soils--Continued

Geomorphic surface	Landform and landscape position	Stratigraphy	Series	Classification	Comments ("active, metastable," and "stable" are used to describe slopes in the Looney unit)
SOILS OF THE INTERIOR VALLEY LOWLANDS					
Dolph	Alluvial fan	Slope alluvium and colluvium over sedimentary residuum	Pengra	Typic Epiaquolls	Clay at 12-20 inches; clay formed in residuum
			Sutherlin	Ultic Haploxeralfs	Clay at 20-26 inches; clay formed in residuum
		Alluvium and colluvium from basalt	Yoncalla	Aquic Palexerolls	Clay at 12-20 inches; clay formed in residuum
		Gravelly alluvium	Abegg	Ultic Haploxeralfs	
		Alluvium from basalt	Natroy	Xeric Endoaquerts	Montmorillonitic; associated with pillow basalt uplands
		Clayey alluvium	Curtin	Aquic Haploxererts	Montmorillonitic; associated with pillow basalt uplands
	Hill toeslope and depression	Sandstone and siltstone colluvium and residuum	Dupee	Aquultic Haploxeralfs	Formed on depositional, concave slopes
	Hill side slope and ridge		Dickerson	Lithic Xerorthents	Very shallow, south-facing slopes from sedimentary rock
			Nonpareil	Dystric Xerochrepts	
			Oakland	Ultic Haploxeralfs	
		Pillow basalt residuum and colluvium	Dixonville	Pachic Ultic Argixerolls	Color result of parent material and native vegetation
			Philomath	Vertic Haploxerolls	
Eola	High stream terrace	Old alluvium	Windygap	Xeric Haplohumults	Middle to early Pleistocene surface
SOILS OF THE INTERIOR MOUNTAINS					
Looney	Mountain ridge	Basalt residuum and colluvium	Jory	Xeric Palehumults	Formed on stable slopes
		Sandstone and siltstone residuum and colluvium	Windygap	Xeric Haplohumults	Formed on stable slopes
	Mountain side slope		Rosehaven	Ultic Haploxeralfs	Formed on metastable slopes
	Mountain side slope and headwall	Sandstone and siltstone colluvium	Atring	Dystric Xerochrepts	Formed on active slopes
		Basalt colluvium	Ritner	Dystric Xerochrepts	Formed on active slopes
			Sahaptin	Lithic Ultic Haploxerolls	Color result of parent material

Formation of the Soils--Continued

Geomorphic surface	Landform and landscape position	Stratigraphy	Series	Classification	Comments ("active, metastable," and "stable" are used to describe slopes in the Looney unit)
SOILS OF THE KLAMATH MOUNTAINS					
Eola	High stream terrace	Old alluvium	Dumont	Typic Palexerults	Middle to early Pleistocene surface; high in kaolinite
Looney	Mountain ridge	Metamorphic residuum and colluvium	Dumont	Typic Palexerults	Formed on stable slopes
	Mountain footslope	Granodiorite, metasedimentary, and volcanic colluvium and residuum	Zing	Aquultic Haploxeralfs	Formed on depositional, metastable slopes
		Granodiorite and mica schist residuum and colluvium	Beal	Ultic Haploxeralfs	Formed on depositional, metastable slopes
		Serpentine colluvium	Peel	Vertic Argixerolls	Color result of grassy native vegetation
	Hill side slope	Sandstone residuum and colluvium	Brader	Typic Xerochrepts	Shallow, south-facing slopes from sedimentary rock
	Mountain side slope	Metasedimentary colluvium and residuum	Norling	Ultic Haploxeralfs	Metastable slopes
		Granodiorite residuum and colluvium	Lettia	Ultic Haploxeralfs	Metastable slopes
		Mica schist residuum and colluvium	Dompier	Aquic Fragixeralfs	Fragipan thought to be formed on middle to early Pleistocene surface
		Sandstone and siltstone residuum and colluvium	Dicecreek	Dystric Lithic Xerochrepts	Shallow, south-facing slopes from sedimentary rock
	Mountain ridge	Metamorphic residuum and colluvium	McMullin	Lithic Ultic Haploxerolls	Color result of grassy native vegetation and parent material

Formation of the Soils--Continued

Geomorphic surface	Landform and landscape position	Stratigraphy	Series	Classification	Comments ("active, metastable," and "stable" are used to describe slopes in the Looney unit)
SOILS OF THE KLAMATH MOUNTAINS					
Looney	Mountain side slope and headwall	Conglomerate residuum and colluvium	Hilltish	Dystric Xerochrepts	Metastable and active slopes on Riddle Formation
			Chimneyrock	Ultic Haploxeralfs	Metastable and active slopes on Lookingglass Formation
		Metamorphic colluvium	Vermisa	Lithic Xerochrepts	Active slopes
		Granodiorite colluvium	Steinmetz	Dystric Xerochrepts	Active slopes
		Mica schist residuum and colluvium	Sharpshooter	Ultic Haploxerolls	Color result of parent material, on metastable and active slopes
			Threeforks	Typic Haplumbrepts	Udic equivalent to Sharpshooter; metastable and active slopes
		Serpentine residuum and colluvium	Dubakella	Mollic Haploxeralfs	Formed under "serpentine barren"; on metastable and active slopes
		Serpentine colluvium	Gravecreek	Dystric Xerochrepts	Active slopes
SOILS OF THE COAST RANGE MOUNTAINS					
Looney	Mountain broad ridge	Sandstone and siltstone residuum and colluvium	Absaquil	Typic Haplohumults	High rainfall causes leaching and lush plant growth, influencing low base status and high organic carbon content
			Honeygrove	Typic Palehumults	
			Blachly	Umbric Dystrochrepts	Formed under very high rainfall; very leached and red hues
	Mountain side slope		Fernhaven	Typic Paleudults	Formed at drier eastern edge of Coast Range; lower organic carbon content
			Preacher	Andic Haplumbrepts	Andic because of high organic carbon content and parent material
			Digger	Dystric Eutrochrepts	Active slopes, influencing lower organic carbon content
	Mountain headwall	Sandstone colluvium	Umpcoos	Lithic Eutrochrepts	
	Mountain side slope		Damewood	Pachic Haplumbrepts	Active slopes; high organic carbon content because of very high rainfall
		Basalt colluvium	Laderly	Alic Hapludands	Formed at high elevations; andic because of high organic carbon content and parent material
		Volcanic rock colluvium	Romanose	Lithic Hapludands	

Formation of the Soils--Continued

Geomorphic surface	Landform and landscape position	Stratigraphy	Series	Classification	Comments ("active, metastable," and "stable" are used to describe slopes in the Looney unit)
SOILS OF THE WESTERN CASCADE MOUNTAINS					
Looney	Mountain ridge	Volcanic residuum and colluvium	Sweetbriar	Ultic Haploxeralfs	Formed at western edge of Cascades on stable to metastable slopes
			Orford	Typic Palehumults	Stable slopes
			Thistleburn	Typic Palehumults	Stable slopes at high elevations
			Keel	Typic Haplocryands	Andic because of high organic carbon content and parent material; on stable to metastable slopes at high elevations
	Mountain footslope and side slope		Zing	Aquultic Haploxeralfs	Formed at western edge of Cascades on footslopes and concave side slopes
			Gustin	Aquic Haplohumults	Formed on footslopes and concave side slopes
			Telemon	Aquic Palehumults	Formed in swales and on concave side slopes at high elevations
	Mountain side slope		Klickitat	Typic Haplumbrepts	Active slopes
			Mellowmoon	Typic Haplumbrepts	Stable and metastable slopes at high elevations
			Oneonta	Typic Haplocryands	Formed on high divides; andic because of high organic carbon content and parent material

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte. An isolated small mountain or hill with steep or precipitous sides and a top variously flat, rounded, or pointed that may be a residual mass isolated by erosion or an exposed volcanic neck.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Canyon. A long, deep, narrow, very steep sided valley with high, precipitous walls in an area of high local relief.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conglomerate. A coarse grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Deflation plain. The broad interdune area that is scoured by wind to the level of the water table in summer.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune, stabilized. A sand hill or ridge that currently is not affected by wind erosion. It supports a significant amount of plant cover.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Embayment. The formation of a bay along a coast. Also, the bay itself.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport sites (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Foredune. A coastal sand hill or ridge oriented parallel to the shoreline and stabilized by vegetation. It is at the landward margin of the beach, along the shoreward face of a beach ridge, or at the landward limit of the highest tide.

Foredune, active. An unstable barrier ridge of sand paralleling the beach and subject to wind erosion, water erosion, and new deposits of sand. It may support areas of beachgrass. An active foredune can be in sand pits and at the mouth of a river as well as in other places.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Headwall. A steep slope near the top of a side slope.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. The relatively undissected upland or ridge between two adjacent valleys that have streams flowing in the same direction.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as “saturated hydraulic conductivity,” which is defined in the “Soil Survey Manual.” In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as “permeability.” Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. The slope between a drainageway and the adjacent interfluve.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 3 percent
Gently sloping	3 to 12 percent
Moderately sloping	12 to 30 percent
Steep	30 to 60 percent
Very steep	60 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Slump block. The mass of material torn away as a coherent unit during slumping.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil blowing (in tables). The wearing away of the land surface by wind.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates.

The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus. Fragments of rock and other soil material accumulated by gravity at the foot of cliffs or steep slopes.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Ultramafic rock. An igneous rock composed dominantly of mafic minerals such as hypersthene, augite, and olivine.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Volcanic rock. Rock that is ejected explosively or is extruded as lava as a result of volcanic action at or near the earth’s surface.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

The tables in this survey give the properties and interpretations for the major components, which are given in the detailed soil map unit names. The properties and interpretations for the minor components, which are listed in the detailed soil map units, will be available in the National Soil Information System (NASIS) database for the survey area when the data fields for this information are populated.