United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with the
Research Division of the
College of Agricultural and
Life Sciences, University of
Wisconsin

Soil Survey of Richland County, Wisconsin

Subset of Major Land Resource Area 105

Where To Get More Information

More soils information is available from the Natural Resources Conservation Service (NRCS) Soils Web site (http://soils.usda.gov). This site includes links to other sites where additional information specific to the soils in Richland County can be accessed, including the NRCS Soil Data Mart (http://soildatamart.nrcs.usda.gov) and the NRCS Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app).

Additional local information is available from the NRCS Field Office Technical Guide at Richland Center, Wisconsin, or online at www.nrcs.usda.gov/technical/efotg.

For further information, please contact:

USDA, Natural Resources Conservation Service
Richland Center Service Center
26136 Executive Lane
Richland Center, WI 53581
Phone: (608) 647-8874

How To Use This Soil Survey

The information provided in this publication can be useful in planning the use and management of small areas. The text includes descriptions of detailed soil map units and provides an explanation of the information presented in the tables, or soil reports, which are available via the Web Soil Survey of the Natural Resources Conservation Service (accessible from the Soils Web site at http://soils.usda.gov). The publication also includes a glossary of terms used in the text and tables and a list of references.

Bookmarks and links in the publication allow the user to navigate from one part of the text to another. Maps showing soil lines and map unit symbols can be accessed for a particular area of interest through Web Soil Survey. The symbols on the maps represent the detailed soil map units in the area. These map units are listed in the bookmarks panel of the text. Information about the map units can be accessed by clicking on the appropriate bookmark.

The bookmarks panel of the text outlines the contents of this publication.

National Cooperative Soil Survey

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 has leadership for the Federal part of the National Cooperative Soil Survey. Significant funding towards the acceleration and completion of this survey was contributed by the State of Wisconsin Department of Administration, Land Information Board, through the State Soil Survey Initiative. This survey was made cooperatively by the Natural Resources Conservation Service and the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin. Other assistance was provided by the Richland County Land Conservation Department.

Major fieldwork for this soil survey was completed in 2001. Soil names and descriptions were approved in 2002. Digitizing of the survey was completed by the Madison, Wisconsin, NRCS digitizing unit in 2006. The manuscript was compiled in 2004. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2004. The most current official data are available on the Internet.

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.

Nondiscrimination Statement

Additional information about the Nation’s natural resources is available online from the Natural Resources Conservation Service at http://www.nrcs.usda.gov.

Contents

Issued 2006

Foreword

Soil surveys contain information that affects land use planning in survey areas. They include predictions of soil behavior for selected land uses. The surveys highlight soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

Soil surveys are designed for many different users. Farmers, foresters, and agronomists can use the surveys 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 surveys 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 surveys 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 publication is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this publication 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 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. Each soil in the survey area is described, and information on specific uses is given. 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.

Patricia S. Leavenworth
State Conservationist
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Soil Survey of
Richland County, Wisconsin

By Duane T. Simonson, Natural Resources Conservation Service

Fieldwork, landscape interpretation, database development, map compilation, and correlation by Duane Simonson, Joe Jahnke, Donna E. Ferren Guy, Phillip D. Meyer, Matt R. Otto, and Chanc L. Vogel, Natural Resources Conservation Service

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United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin

How This Survey Was Made

This survey was made to provide updated information about the soils and miscellaneous areas in the survey area (fig. 1), which is in Major Land Resource Area 105, Northern Mississippi Valley Loess Hills. Major land resource areas (MLRAs) are geographically associated land resource units that share a common land use, elevation, topography, climate, water, soils, and vegetation (USDA, 2006). Richland County is a subset of MLRA 105. Map unit design is based on documentation of the occurrence of the soils throughout the MLRA.

The information in this survey includes a brief description of the soils and miscellaneous areas. Interpretive tables showing soil properties and the subsequent effects on suitability, limitations, and management for specified uses are also available for this survey area through a link to the Web Soil Survey of the Natural Resources Conservation Service from the NRCS Soils Web site (http://soils.usda.gov). During the fieldwork for this survey, 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 landscape or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, soil scientists develop a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientists to predict with a

Figure 1.—Location of Richland County in Wisconsin.

considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate 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 observed. The maximum depth of observation was about 80 inches (6.7 feet). Soil scientists noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, soil 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.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Interpretations are modified as necessary to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

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 zone in which the soil moisture status is wet within certain depths in most years, but they cannot predict that this zone 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.

The descriptions, names, and delineations of the soils in this survey area may not fully agree with those of adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

Formation and Classification of the Soils

This section relates the soils in the survey area to the major factors of soil formation and describes the system of soil classification.

Formation of the Soils

Soil is produced by the action of soil-forming processes on materials deposited or accumulated by geologic forces. The characteristics and properties of soil in a given area are determined by (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the living organisms on and in the soil, mainly vegetation; (4) relief, or topography; and (5) the length of time the forces of soil formation have acted on the soil material. The relative effect of each of these factors is reflected in the soil profile.

The interaction of these factors during the transformation of the parent material into soil generates complex physical, chemical, and biological processes causing minerals to become weathered and organic matter to accumulate. Material in suspension or in solution moves downward through the soil to form definite layers, or horizons, in the soil. These layers—surface layer, subsurface layer, subsoil, and substratum—are defined in the Glossary.

In Richland County, differences in parent material, vegetation, relief, and time account for most of the differences among the soils. Climate is fairly uniform throughout the county.

All five factors of soil formation are interrelated. When one factor changes, changes in the other four factors result. The following paragraphs describe the factors of soil formation as they relate to the soils in the survey area.

Parent Material

Parent material largely determines the physical and chemical properties of the soil, such as the capacity or ability of the soil to store water and nutrients for plants and the rate at which water can pass through the soil.

In Richland County the soils formed in a wide variety of parent materials. The evolution of the landscape played the major role in the resultant parent materials and thus in the type of soils that have formed.

Climate

Climate influences soil formation by providing moisture and heat necessary for the weathering of parent material. Water dissolves soluble materials and transfers nutrients to the lower parts of the soil. Water also is needed to transform minerals to clay and transfer the clay to the lower layers. Reaction, or pH, is largely influenced by climate. Temperature affects the rate at which chemical reactions proceed. Chemical reactions are slower at freezing than at a higher temperature. Moisture and temperature affect the kinds of plants that grow on the soil. Further organic matter accumulation and decomposition are influenced by moisture and temperature and by vegetation.

The effects of climate are modified by landscape setting and parent material. Relatively large amounts of water are available for soil-forming processes in loess on the hill summits. Little is available for plants in outwash on the valley trains, where much of the rainfall passes through the soil rapidly or where slopes are steep and water runs off quickly. Climate may not remain constant throughout the development of the soil. When drastic climate changes take place, soil-forming processes most likely are altered and a new cycle of soil formation begins. These climate changes can modify the time factor, as the age of the new soil development must be measured from the beginning of the climatic change. The oldest landscapes in Richland County have most likely seen several climatic changes and gone through several cycles of soil formation.

Wind can affect the development of soil by adding or removing fine particles of soil or organic matter. It affects the moisture content of soils by influencing the rate of evaporation.

Climate can also have more localized effects. For example, north- and east-facing slopes tend to be cooler and wetter than south- and west-facing slopes. Depressional areas generally have cooler temperatures for a longer part of the year than summits and slopes of hills.

Richland County has a cool, subhumid continental climate that favors the growth of trees and the formation of leached, acid soils with a thin, dark surface layer and a clay-enriched subsoil. Present climatic differences within the county are too small to have resulted in major differences among the soils.

Climate data for the survey area, including temperature and precipitation, growing season, and frost-free periods, are available at the USDA National Water and Climate Center Web site (http://www.wcc.nrcs.usda.gov/climate/climate-map.html).

Living Organisms

Living organisms, both plants and animals, affect soil formation by providing organic matter and transferring nutrients from the lower layers of the soil to the upper layers. Plants influence the development of specific layers in the soil. Vegetation influences the rate at which clay is transferred from the surface layer to the subsoil. Plants and animals are related to other factors of soil formation, such as soil microclimate, parent material, and landscape setting, all of which collectively can determine the vegetation that grows on a soil.

At the time of settlement, forests covered most of Richland County. Mean annual precipitation is sufficient for the growth of trees on any of the soils; however, natural fires were common in some areas at dry times of the year and helped to maintain the grass vegetation. Native Americans who lived in the area and used these soils also used fire to maintain grass vegetation for ease of cultivation and for attracting game animals. When protected from fire, these soils would follow a succession from grass and forbs to shrubs and finally to oak and pine forest. Many areas of sandy soils along the major rivers formed under tall grass prairie. Areas between the prairies and the deciduous forests were called savannas.

The most striking feature of a prairie or savanna soil profile is the thick layer of organic matter accumulation—commonly 15 inches or more—and the somewhat darkened subsoil beneath. Prairie soils contain as much as 120 tons of organic matter per acre, compared with 70 tons per acre for forested soils. A dense network of grass roots fills the profile, and most of the roots extend to a depth of 5 to 7 feet. Forb roots of various shapes and lengths are interspersed; some penetrate to a depth of 20 feet. In contrast to forest soils, where organic matter enters the soil from the surface and must be “plowed in” by earthworms, the organic matter deeply incorporated in prairie soils comes from the roots as they decay in place. There is little contribution from litter at the surface.

Mound-building ants play an important role in the development of prairie soils. They mix and aerate the soil as they build their tunnels and bring up nutrients and clay particles from the subsoil. Their activities increase the levels of potassium and phosphorus in the topsoil.

When a prairie burns, nitrogen in the litter is oxidized and escapes from the prairie ecosystem. Nitrogen is returned to the system through nitrogen-fixing bacteria in the root nodules of the plentiful prairie legumes and also through free-living nitrogen-fixing bacteria in the root zones of the prairie grasses.

It was the deep, rich prairie soils that eventually led to the nearly total conversion of tall grass prairie to agricultural crops (Packard and Mutel, 1997).

Topography

Topography is an important factor in soil formation because it affects drainage, aeration, and erosion.

Because topography influences runoff and drainage, it can affect the types of vegetation present and the chemical changes on and in the soil. Soil profile development occurs most rapidly on well drained, gentle slopes. Profile development is very slow on steep slopes, where runoff is rapid, the rate of water infiltration is slow, and geologic erosion removes the surface soil almost as quickly as it forms. Excessive runoff reduces the amount of water that is available for leaching the soil and for use by plants, and it can increase the hazard of erosion. The position of a soil on the landscape affects the drainage class of the soil. Drainage has a distinct influence on soil formation.

Differences in topography can account for the formation of different soils in similar kinds of parent material.

Time

Time is needed in order for climate and plants and animals to act on the parent material. Various soils have developed over periods of time ranging from a few years to many thousands of years. The effect of time on soil is modified by all the other factors of soil formation.

The length of time in which soils are exposed at the surface is a modifying factor in soil formation. Soils can be no older than the age of the landscape surface upon which they form (Ruhe, 1975). Not all the soils that form the surface of the landscape in Richland County are the same age. Landscapes erode back from their base level along streams and rivers to near the landscape summit. The summit remains stable, little affected by erosive forces. Where carbonates were present in the loess, they are typically deeply leached, and the soils are well developed and are relatively older than the soils downslope. Downslope erosion over long periods of time has exposed fresh material. Another factor modifying the effects of time is the rate at which parent material can be transformed into soils. The small particles in loess, for example, weather relatively rapidly. On the other hand, the larger particles in sandstone bedrock and in outwash on valley trains have a high proportion of slowly weatherable minerals, such as quartz, and are transformed very slowly into soils that have distinct layers.

Landscape setting modifies the time factor because rainfall runs rapidly off steep slopes. Only a small amount of water enters the soil to form clay or leach carbonates and other soluble material.

The effects of time are also modified by the effects of climate. The soils of Richland County formed in a climate that has varied during their formation. During the early stages of soil formation, the climate was cold because of the proximity to glacial ice to the west, north, and east. The early vegetation consisted of conifers followed briefly by oaks. These species were short lived following the retreat of glacial ice northward. The ensuing climate was warmer and drier and caused prairie plants to migrate eastward (Borchart, 1950).

About 4,000 to 5,000 years ago, the climate became cooler and more moist. The big woods spread westward once again. Aspect and topography were also factors in the expansion of the woodland. Timber probably became established first on the sheltered north- and east-facing footslopes. Trees may have even persisted here during the eastward migration of the prairie. From these sheltered sites, timber spread out onto the silty and loamy terraces and upward onto the ridgetops. Except for broad sandy areas along major rivers, the landscape at the time of settlement was covered with woodland.

The character of the soils encroached upon by woodland changed in response to processes generated by the timber. Forests produce little organic material, most of which accumulates on the soil surface. In contrast, the prairie soils build up large amounts of organic matter and form a thick dark surface layer.

The organic material produced by the decay of leaves, limbs, and trunks is more acid than that produced by prairie vegetation. The strong acids formed by water percolating through the surface litter and into the soil increased the mobility of clay, organic matter, and oxides and allowed them to be leached away or to accumulate in the subsoil. The dark surface layer of soils that had previously formed under prairie vegetation gradually became thinner. As clay and organic matter were removed, a thin bleached subsurface layer began to form just below the thinning surface layer. Clay and organic matter accumulated as thin waxy films on blocky peds in the subsoil and along cracks and pores formerly occupied by roots. Fully developed forest soils have a black or very dark brown surface layer 2 to 4 inches thick; an ashy, grayish subsurface layer that is low in clay and organic matter and is 5 to 10 inches thick; and a subsoil with structural development and clay and organic matter on blocky structural surfaces. When the land was cleared and cultivated, the thin surface and subsurface layers were commonly lost to erosion, and in many places tillage mixed the remaining upper layers with material from the upper part of the subsoil.

Some soils reflect the influence of both prairie and woodland because prairie did not persist long enough to alter the woodland soils completely.

Assuming all other factors are equal, soils form more rapidly in warmer, more humid conditions than those of the present climate affecting Richland County. Soils are frozen to some depth, and the soil-forming process is drastically reduced for much of the year in this cool, subhumid continental climate.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999 and 2003). 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.

ORDER. Twelve 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 Mollisol.

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 Aquoll (*Aqu,* meaning water, plus *oll,* from Mollisol).

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; 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 Endoaquolls (*Endo,* meaning within, plus *aquolls,* the suborder of the Mollisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic 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 known kind of soil. 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 Endoaquolls.

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 class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, active, mesic Typic Endoaquolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

The Official Series Descriptions (OSDs) provide the most current information about the series mapped in Richland County. These descriptions are available on the Web at http://soils.usda.gov.

Soil Map Unit Descriptions

The map units delineated on the soil maps for this survey area represent the soils or miscellaneous areas in the survey area. These soils or miscellaneous areas are listed as individual components in the map unit descriptions. 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. More information about each map unit is provided in various tables, which are accessible from the Soil Data Explorer/Soil Reports tab in Web Soil Survey. Web Soil Survey can be accessed from the NRCS Soils Web site (http://soils.usda.gov).

A map unit delineation on the soil maps represents an area on the landscape. It is identified by differences in the properties and taxonomic classification of components and by the percentage of each component in the map unit.

Components that are dissimilar, or contrasting, are identified in the map unit description. Dissimilar components are those that have properties and behavioral characteristics divergent enough from those of the major components to affect use or to require different management. 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.

Components that are similar to the major components (noncontrasting) are not identified in the map unit description. Similar components are those that have properties and behavioral characteristics similar enough to those of the major components that they do not affect use or require different management.

The presence of multiple components 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 segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol is used for each map unit on the soil maps. This symbol precedes the map unit name in the map unit descriptions. Each description includes general information about the unit. The map unit descriptions include representative values in feet and the months in which a wet zone (a zone in which the soil moisture status is wet) is highest and lowest in the soil profile and ponding is shallowest and deepest on the soil surface. The descriptions also include the frequency of flooding (if it occurs) and the months in which flooding is most frequent and least frequent. The “Water Features” report provides a complete display of this data for every month of the year. The available water capacity given in each map unit description is calculated for all horizons in the upper 60 inches of the soil profile. The organic matter content displayed in each map unit description is calculated for all horizons in the upper 10 inches of the soil profile, except those that represent the surface duff layer on forested soils. The “Physical Soil Properties” report provides a complete display of available water capacity and organic matter content by horizon.

Some of the principal hazards and limitations to be considered in planning for specific uses are described in other sections of this survey.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, 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 or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. The name of a soil phase commonly indicates a feature that affects use or management.

A map unit is named for the component or components that make up a dominant percentage of the map unit. Many map units consist of one dominant component. These map units are consociations.

Some map units are made up of two or more dominant components. These map units are complexes or undifferentiated groups.

A *complex* consists of two or more components in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. Attempting to delineate the individual components of a complex would result in excessive clutter that could make the map illegible. The pattern and proportion of the components in a complex are somewhat similar in all areas.

An *undifferentiated group* is made up of two or more components that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the components in a mapped area are not uniform. An area can be made up of only one of the dominant components, or it can be made up of all of them.

This survey includes miscellaneous areas. Such areas have little or no soil material and support little or no vegetation.

The table “Acreage and Proportionate Extent of the Soils” provides a complete listing of the detailed soil map units in Richland County. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

20A—Palms and Houghton mucks, 0 to 1 percent slopes

Component Description

Palms and similar soils
Extent: 0 to 90 percent of the unit
Geomorphic setting: Depressions on stream terraces
Slope range: 0 to 1 percent
Texture of the surface layer: Muck
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Organic material over loamy alluvium
Flooding: None
Shallowest depth to wet zone: At the surface (January, February, March, April, May, October, November, December)
Deepest depth to wet zone: 1.0 foot (August)
Shallowest ponding: 0.3 foot (January, February, June, July, August, September, December)
Deepest ponding: 0.5 foot (March, April, May, October, November)
Available water capacity to a depth of 60 inches: 19.4 inches
Content of organic matter in the upper 10 inches: 55.0 percent

Typical profile:
Oa—0 to 40 inches; muck
Cg—40 to 60 inches; silt loam

Houghton and similar soils
Extent: 0 to 90 percent of the unit
Geomorphic setting: Depressions on stream terraces
Slope range: 0 to 1 percent
Texture of the surface layer: Muck
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Organic material
Flooding: None
Shallowest depth to wet zone: At the surface (January, February, March, April, May, June, July, September, October, November, December)
Deepest depth to wet zone: 0.5 foot (August)
Shallowest ponding: 0.5 foot (January, February, July, August, December)
Deepest ponding: 1.0 foot (March, April, May, June, September, October, November)
Available water capacity to a depth of 60 inches: 24.5 inches
Content of organic matter in the upper 10 inches: 55.0 percent
Typical profile:
Oa—0 to 22 inches; muck
Oe—22 to 28 inches; mucky peat
O´a—28 to 60 inches; muck

Minor Dissimilar Components

Palms, drained, and similar soils
Extent: 0 to 5 percent of the unit

Ettrick and similar soils
Extent: 1 to 10 percent of the unit

Water
Extent: 1 to 5 percent of the unit

21A—Palms muck, 0 to 1 percent slopes, frequently flooded

Component Description

Palms and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Backswamps on flood plains
Slope range: 0 to 1 percent
Texture of the surface layer: Muck
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Organic material over loamy alluvium
Lowest frequency of flooding (if it occurs): Rare (January, February, July, August, October, November, December)
Highest frequency of flooding: Frequent (March, April, May, June)
Shallowest depth to wet zone: At the surface (January, February, March, April, May, October, November, December)
Deepest depth to wet zone: 1.0 foot (August)

Shallowest ponding: 0.3 foot (January, February, June, July, August, September, December)
Deepest ponding: 0.5 foot (March, April, May, October, November)
Available water capacity to a depth of 60 inches: 19.4 inches
Content of organic matter in the upper 10 inches: 55.0 percent
Typical profile:
Oa—0 to 40 inches; muck
Cg—40 to 60 inches; silt loam

Minor Dissimilar Components

Ettrick and similar soils
Extent: 0 to 5 percent of the unit

Kalmarville and similar soils
Extent: 0 to 5 percent of the unit

Water
Extent: 0 to 5 percent of the unit

115C2—Seaton silt loam, 6 to 12 percent slopes, moderately eroded

Component Description

Seaton and similar soils
Extent: 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 6 to 12 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.7 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 8 inches; silt loam
BE—8 to 13 inches; silt loam
Bt—13 to 55 inches; silt loam
BC—55 to 80 inches; silt loam

115D2—Seaton silt loam, 12 to 20 percent slopes, moderately eroded

Component Description

Seaton and similar soils
Extent: 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 12 to 20 percent

Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.7 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 8 inches; silt loam
BE—8 to 13 inches; silt loam
Bt—13 to 55 inches; silt loam
BC—55 to 80 inches; silt loam

116C2—Churchtown silt loam, 6 to 12 percent slopes, moderately eroded

Component Description

Churchtown and similar soils
Extent: 95 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Footslopes
Slope range: 6 to 12 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy slope alluvium over loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.4 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 9 inches; silt loam
Bt—9 to 26 inches; silt loam
2Bt—26 to 63 inches; silt loam
2BC—63 to 80 inches; silt loam

Minor Dissimilar Components

Norden and similar soils
Extent: 0 to 5 percent of the unit

116D2—Churchtown silt loam, 12 to 20 percent slopes, moderately eroded

Component Description

Churchtown and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Footslopes

Slope range: 12 to 20 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy slope alluvium over loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.4 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 9 inches; silt loam
Bt—9 to 26 inches; silt loam
2Bt—26 to 63 inches; silt loam
2BC—63 to 80 inches; silt loam

Minor Dissimilar Components

Norden and similar soils
Extent: 0 to 10 percent of the unit

Brownchurch and similar soils
Extent: 0 to 5 percent of the unit

Beavercreek and similar soils
Extent: 0 to 4 percent of the unit

116E2—Churchtown silt loam, 20 to 30 percent slopes, moderately eroded

Component Description

Churchtown and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Footslopes
Slope range: 20 to 30 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy slope alluvium over loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.4 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 9 inches; silt loam
Bt—9 to 26 inches; silt loam
2Bt—26 to 63 inches; silt loam
2BC—63 to 80 inches; silt loam

Minor Dissimilar Components

Norden and similar soils
Extent: 0 to 15 percent of the unit

Brownchurch and similar soils
Extent: 0 to 5 percent of the unit

Beavercreek and similar soils
Extent: 0 to 4 percent of the unit

117D2—Brownchurch sandy loam, 12 to 20 percent slopes, moderately eroded

Component Description

Brownchurch and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Footslopes
Slope range: 12 to 20 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy slope alluvium over silty slope alluvium
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 10.6 inches
Content of organic matter in the upper 10 inches: 2.1 percent
Typical profile:
Ap—0 to 6 inches; sandy loam
Bt—6 to 30 inches; sandy loam
2Bt—30 to 62 inches; silt loam
2BC—62 to 80 inches; silt loam

Minor Dissimilar Components

Churchtown and similar soils
Extent: 0 to 10 percent of the unit

117E2—Brownchurch sandy loam, 20 to 30 percent slopes, moderately eroded

Component Description

Brownchurch and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Footslopes
Slope range: 20 to 30 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy slope alluvium over silty slope alluvium
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 10.6 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Typical profile:
Ap—0 to 6 inches; sandy loam
Bt—6 to 30 inches; sandy loam
2Bt—30 to 62 inches; silt loam
2BC—62 to 80 inches; silt loam

Minor Dissimilar Components

Churchtown and similar soils
Extent: 0 to 5 percent of the unit

Gaphill and similar soils
Extent: 0 to 5 percent of the unit

Rockbluff and similar soils
Extent: 0 to 5 percent of the unit

122B2—Newhouse silt loam, 2 to 6 percent slopes, moderately eroded

Component Description

Newhouse and similar soils
Extent: 85 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Summits
Slope range: 2 to 6 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 60 to 80 inches to bedrock (lithic)
Drainage class: Well drained
Parent material: Loess over loamy pedisediment
Flooding: None
Depth to wet zone: More than 5.0 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 9.8 inches
Content of organic matter in the upper 10 inches: 2.4 percent
Typical profile:
Ap—0 to 9 inches; silt loam
BE—9 to 13 inches; silt loam
Bt—13 to 25 inches; silt loam
2Bt—25 to 60 inches; stratified channery fine sandy loam to clay loam

Minor Dissimilar Components

Blackhammer and similar soils
Extent: 0 to 10 percent of the unit

NewGlarus and similar soils
Extent: 0 to 10 percent of the unit

123C2—Blackhammer silt loam, 6 to 12 percent slopes, moderately eroded

Component Description

Blackhammer and similar soils
Extent: 85 to 95 percent of the unit

Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 6 to 12 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 60 to 80 inches to bedrock (lithic)
Drainage class: Well drained
Parent material: Loess over loamy pedisediment
Flooding: None
Depth to wet zone: More than 5.0 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 9.7 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 9 inches; silt loam
Bt—9 to 26 inches; silt loam
2Bt—26 to 60 inches; stratified channery fine sandy loam to clay loam

Minor Dissimilar Components

Newhouse and similar soils
Extent: 0 to 10 percent of the unit

NewGlarus and similar soils
Extent: 0 to 10 percent of the unit

123D2—Blackhammer silt loam, 12 to 20 percent slopes, moderately eroded

Component Description

Blackhammer and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 12 to 20 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 60 to 80 inches to bedrock (lithic)
Drainage class: Well drained
Parent material: Loess over loamy pedisediment
Flooding: None
Depth to wet zone: More than 5.0 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 9.7 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 9 inches; silt loam
Bt—9 to 26 inches; silt loam
2Bt—26 to 60 inches; stratified channery fine sandy loam to clay loam

Minor Dissimilar Components

Newhouse and similar soils
Extent: 0 to 10 percent of the unit

NewGlarus and similar soils
Extent: 0 to 10 percent of the unit

126B—Barremills silt loam, 1 to 6 percent slopes

Component Description

Barremills and similar soils
Extent: 85 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Footslopes
Slope range: 1 to 6 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Silty slope alluvium over loess
Flooding: None
Shallowest depth to wet zone: 4.5 feet (May)
Deepest depth to wet zone: More than 6.7 feet (January, February, March, July, August, September, December)
Ponding: None
Available water capacity to a depth of 60 inches: 13.1 inches
Content of organic matter in the upper 10 inches: 3.0 percent
Typical profile:
Ap,A,AB—0 to 27 inches; silt loam
Bt—27 to 65 inches; silt loam
BC—65 to 80 inches; silt loam

Minor Dissimilar Components

Toddville and similar soils
Extent: 0 to 10 percent of the unit

Arenzville and similar soils
Extent: 0 to 10 percent of the unit

132B2—Brinkman silt loam, 2 to 6 percent slopes, moderately eroded

Component Description

Brinkman and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Summits
Slope range: 2 to 6 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loess over clayey pedisediment
Flooding: None
Shallowest depth to wet zone: 4.5 feet (May)
Deepest depth to wet zone: More than 6.7 feet (January, February, March, July, August, September, December)
Ponding: None
Available water capacity to a depth of 60 inches: 12.7 inches
Content of organic matter in the upper 10 inches: 2.3 percent
Typical profile:
Ap—0 to 9 inches; silt loam

Bt—9 to 71 inches; silt loam
2Bt—71 to 80 inches; clay

Minor Dissimilar Components

Valton and similar soils
Extent: 0 to 10 percent of the unit

Mt. Carroll and similar soils
Extent: 0 to 10 percent of the unit

132C2—Brinkman silt loam, 6 to 12 percent slopes, moderately eroded

Component Description

Brinkman and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 6 to 12 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loess over clayey pedisediment
Flooding: None
Shallowest depth to wet zone: 4.5 feet (May)
Deepest depth to wet zone: More than 6.7 feet (January, February, March, July, August, September, December)
Ponding: None
Available water capacity to a depth of 60 inches: 12.7 inches
Content of organic matter in the upper 10 inches: 1.9 percent
Typical profile:
Ap—0 to 9 inches; silt loam
Bt—9 to 71 inches; silt loam
2Bt—71 to 80 inches; clay

Minor Dissimilar Components

Valton and similar soils
Extent: 0 to 10 percent of the unit

Mt. Carroll and similar soils
Extent: 0 to 10 percent of the unit

133B2—Valton silt loam, 2 to 6 percent slopes, moderately eroded

Component Description

Valton and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Summits
Slope range: 2 to 6 percent

Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess over clayey pedisediment
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 8.8 inches
Content of organic matter in the upper 10 inches: 2.3 percent
Typical profile:
Ap—0 to 9 inches; silt loam
Bt—9 to 22 inches; silt loam
2Bt—22 to 60 inches; clay

Minor Dissimilar Components

Brinkman and similar soils
Extent: 0 to 10 percent of the unit

Lamoille and similar soils
Extent: 0 to 10 percent of the unit

133C2—Valton silt loam, 6 to 12 percent slopes, moderately eroded

Component Description

Valton and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess over clayey pedisediment
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 8.8 inches
Content of organic matter in the upper 10 inches: 2.3 percent
Typical profile:
Ap—0 to 9 inches; silt loam
Bt—9 to 22 inches; silt loam
2Bt—22 to 60 inches; clay

Minor Dissimilar Components

Brinkman and similar soils
Extent: 0 to 10 percent of the unit

Lamoille and similar soils
Extent: 0 to 10 percent of the unit

133D2—Valton silt loam, 12 to 20 percent slopes, moderately eroded

Component Description

Valton and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 12 to 20 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess over clayey pedisediment
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 8.8 inches
Content of organic matter in the upper 10 inches: 2.3 percent
Typical profile:
Ap—0 to 9 inches; silt loam
Bt—9 to 22 inches; silt loam
2Bt—22 to 60 inches; clay

Minor Dissimilar Components

Brinkman and similar soils
Extent: 0 to 10 percent of the unit

Lamoille and similar soils
Extent: 0 to 10 percent of the unit

134B2—Lamoille silt loam, 2 to 6 percent slopes, moderately eroded

Component Description

Lamoille and similar soils
Extent: 85 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Summits
Slope range: 2 to 6 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 40 to 100 inches to bedrock (lithic)
Drainage class: Well drained
Parent material: Loess over clayey pedisediment
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.7 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 9 inches; silt loam
E,BE—9 to 13 inches; silt loam

2Bt—13 to 27 inches; clay
3Bt—27 to 37 inches; very cobbly clay loam
3C—37 to 60 inches; very cobbly loam

Minor Dissimilar Components

Valton and similar soils
Extent: 0 to 15 percent of the unit

134C2—Lamoille silt loam, 6 to 12 percent slopes, moderately eroded

Component Description

Lamoille and similar soils
Extent: 85 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 40 to 100 inches to bedrock (lithic)
Drainage class: Well drained
Parent material: Loess over clayey pedisediment
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.7 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 9 inches; silt loam
E,BE—9 to 13 inches; silt loam
2Bt—13 to 27 inches; clay
3Bt—27 to 37 inches; very cobbly clay loam
3C—37 to 60 inches; very cobbly loam

Minor Dissimilar Components

Valton and similar soils
Extent: 0 to 15 percent of the unit

137B—Mickle silt loam, 2 to 6 percent slopes

Component Description

Mickle and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Hills
Slope range: 2 to 6 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Silty slope alluvium
Flooding: None

Shallowest depth to wet zone: 4.5 feet (May)
Deepest depth to wet zone: More than 6.7 feet (January, February, March, June, July, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.5 inches
Content of organic matter in the upper 10 inches: 2.5 percent
Typical profile:
Ap—0 to 12 inches; silt loam
BE—12 to 18 inches; silt loam
Bt—18 to 65 inches; silt loam
BC—65 to 80 inches; silt loam

Minor Dissimilar Components

Blackhammer and similar soils
Extent: 0 to 5 percent of the unit

NewGlarus and similar soils
Extent: 0 to 5 percent of the unit

137C—Mickle silt loam, 6 to 12 percent slopes

Component Description

Mickle and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Footslopes
Slope range: 6 to 12 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Silty slope alluvium
Flooding: None
Shallowest depth to wet zone: 4.5 feet (May)
Deepest depth to wet zone: More than 6.7 feet (January, February, March, June, July, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.5 inches
Content of organic matter in the upper 10 inches: 2.5 percent
Typical profile:
Ap—0 to 12 inches; silt loam
BE—12 to 18 inches; silt loam
Bt—18 to 65 inches; silt loam
BC—65 to 80 inches; silt loam

Minor Dissimilar Components

Blackhammer and similar soils
Extent: 0 to 5 percent of the unit

NewGlarus and similar soils
Extent: 0 to 5 percent of the unit

144B2—NewGlarus silt loam, 2 to 6 percent slopes, moderately eroded

Component Description

NewGlarus and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Summits
Slope range: 2 to 6 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 40 to 60 inches to bedrock (lithic)
Drainage class: Well drained
Parent material: Loess over clayey pedisediment over loamy residuum
Flooding: None
Depth to wet zone: More than 3.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.4 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 9 inches; silt loam
BE—9 to 13 inches; silt loam
Bt—13 to 23 inches; silty clay loam
2Bt—23 to 35 inches; clay
3Bt—35 to 45 inches; very channery loam
3Rt—45 to 60 inches; weathered bedrock

Minor Dissimilar Components

Fivepoints and similar soils
Extent: 1 to 5 percent of the unit

Pepin and similar soils
Extent: 1 to 5 percent of the unit

Brinkman and similar soils
Extent: 0 to 5 percent of the unit

144C2—NewGlarus silt loam, 6 to 12 percent slopes, moderately eroded

Component Description

NewGlarus and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 6 to 12 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 40 to 60 inches to bedrock (lithic)
Drainage class: Well drained
Parent material: Loess over clayey pedisediment over loamy residuum
Flooding: None
Depth to wet zone: More than 3.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.4 inches

Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 9 inches; silt loam
BE—9 to 13 inches; silt loam
Bt—13 to 23 inches; silty clay loam
2Bt—23 to 35 inches; clay
3Bt—35 to 45 inches; very channery loam
3Rt—45 to 60 inches; weathered bedrock

Minor Dissimilar Components

Fivepoints and similar soils
Extent: 1 to 5 percent of the unit

Pepin and similar soils
Extent: 1 to 5 percent of the unit

Brinkman and similar soils
Extent: 0 to 5 percent of the unit

144D2—NewGlarus silt loam, 12 to 20 percent slopes, moderately eroded

Component Description

NewGlarus and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 12 to 20 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 40 to 60 inches to bedrock (lithic)
Drainage class: Well drained
Parent material: Loess over clayey pedisediment over loamy residuum
Flooding: None
Depth to wet zone: More than 3.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.4 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 9 inches; silt loam
BE—9 to 13 inches; silt loam
Bt—13 to 23 inches; silty clay loam
2Bt—23 to 35 inches; clay
3Bt—35 to 45 inches; very channery loam
3Rt—45 to 60 inches; weathered bedrock

Minor Dissimilar Components

Fivepoints and similar soils
Extent: 1 to 5 percent of the unit

Pepin and similar soils
Extent: 1 to 5 percent of the unit

Brinkman and similar soils
Extent: 0 to 5 percent of the unit

161B2—Fivepoints silt loam, 2 to 6 percent slopes, moderately eroded

Component Description

Fivepoints and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 2 to 6 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 20 to 40 inches to bedrock (lithic)
Drainage class: Well drained
Parent material: Loess over clayey pedisediment over loamy residuum
Flooding: None
Depth to wet zone: More than 2.9 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 4.3 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
Ap—0 to 7 inches; silt loam
Bt1—7 to 10 inches; silty clay loam
2Bt2—10 to 19 inches; clay
3Bt3—19 to 35 inches; very channery loam
3Rt—35 to 80 inches; weathered bedrock

Minor Dissimilar Components

NewGlarus and similar soils
Extent: 0 to 15 percent of the unit

161C2—Fivepoints silt loam, 6 to 12 percent slopes, moderately eroded

Component Description

Fivepoints and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 6 to 12 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 20 to 40 inches to bedrock (lithic)
Drainage class: Well drained
Parent material: Loess over clayey pedisediment over loamy residuum
Flooding: None
Depth to wet zone: More than 2.9 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 4.3 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
Ap—0 to 7 inches; silt loam
Bt1—7 to 10 inches; silty clay loam
2Bt2—10 to 19 inches; clay

3Bt3—19 to 35 inches; very channery loam
3Rt—35 to 80 inches; weathered bedrock

Minor Dissimilar Components

NewGlarus and similar soils
Extent: 0 to 15 percent of the unit

161D2—Fivepoints silt loam, 12 to 20 percent slopes, moderately eroded

Component Description

Fivepoints and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 12 to 20 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 20 to 40 inches to bedrock (lithic)
Drainage class: Well drained
Parent material: Loess over clayey pedisediment over loamy residuum
Flooding: None
Depth to wet zone: More than 2.9 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 4.3 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
Ap—0 to 7 inches; silt loam
Bt1—7 to 10 inches; silty clay loam
2Bt2—10 to 19 inches; clay
3Bt3—19 to 35 inches; very channery loam
3Rt—35 to 80 inches; weathered bedrock

Minor Dissimilar Components

NewGlarus and similar soils
Extent: 0 to 10 percent of the unit

Lamoille and similar soils
Extent: 0 to 5 percent of the unit

Dorerton and similar soils
Extent: 0 to 5 percent of the unit

Elbaville and similar soils
Extent: 0 to 5 percent of the unit

163E2—Elbaville silt loam, 20 to 30 percent slopes, moderately eroded

Component Description

Elbaville and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Backslopes and shoulders

Slope range: 20 to 30 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 60 to 80 inches to bedrock (lithic)
Drainage class: Well drained
Parent material: Loess over loamy and clayey colluvium over loamy and sandy residuum
Flooding: None
Depth to wet zone: More than 5.0 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.1 inches
Content of organic matter in the upper 10 inches: 1.3 percent
Typical profile:
Ap—0 to 8 inches; silt loam
E—8 to 11 inches; silt loam
B/E,Bt—11 to 21 inches; silt loam
2Bt—21 to 26 inches; silty clay
3Bt—26 to 37 inches; very flaggy silty clay loam
3C—37 to 60 inches; extremely flaggy sandy loam

Minor Dissimilar Components

Dorerton and similar soils
Extent: 0 to 10 percent of the unit

Valton and similar soils
Extent: 0 to 5 percent of the unit

231D—Elevasil sandy loam, 12 to 20 percent slopes, very stony

Component Description

Elevasil and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 12 to 20 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Loamy slope alluvium over sandy residuum
Flooding: None
Depth to wet zone: More than 3.2 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.4 inches
Content of organic matter in the upper 10 inches: 1.0 percent
Typical profile:
Oe—0 to 1 inch; moderately decomposed plant material
A—1 to 4 inches; sandy loam
Bt—4 to 27 inches; sandy loam
2BC—27 to 31 inches; loamy sand
2C—31 to 39 inches; sand
2Cr—39 to 60 inches; weathered bedrock

Minor Dissimilar Components

Boone and similar soils
Extent: 0 to 10 percent of the unit

Hixton and similar soils
Extent: 0 to 5 percent of the unit

234C2—Basco silt loam, 6 to 12 percent slopes, moderately eroded

Component Description

Basco and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Summits and shoulders
Slope range: 6 to 12 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Loess over clayey pedisediment over sandy residuum
Flooding: None
Depth to wet zone: More than 3.0 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.7 inches
Content of organic matter in the upper 10 inches: 2.0 percent
Typical profile:
Ap—0 to 7 inches; silt loam
BE—7 to 11 inches; silt loam
Bt—11 to 16 inches; silty clay loam
2Bt—16 to 33 inches; clay
3C—33 to 36 inches; loamy sand
3Cr—36 to 60 inches; weathered bedrock

Minor Dissimilar Components

Fivepoints and similar soils
Extent: 0 to 5 percent of the unit

Keyesville and similar soils
Extent: 0 to 5 percent of the unit

234D2—Basco silt loam, 12 to 20 percent slopes, moderately eroded

Component Description

Basco and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 12 to 20 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)

Drainage class: Well drained
Parent material: Loess over clayey pedisediment over sandy residuum
Flooding: None
Depth to wet zone: More than 3.0 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.7 inches
Content of organic matter in the upper 10 inches: 2.0 percent
Typical profile:
Ap—0 to 7 inches; silt loam
BE—7 to 11 inches; silt loam
Bt—11 to 16 inches; silty clay loam
2Bt—16 to 33 inches; clay
3C—33 to 36 inches; loamy sand
3Cr—36 to 60 inches; weathered bedrock

Minor Dissimilar Components

Fivepoints and similar soils
Extent: 0 to 5 percent of the unit

Keyesville and similar soils
Extent: 0 to 5 percent of the unit

235F—Keyesville sandy loam, 20 to 65 percent slopes

Component Description

Keyesville and similar soils
Extent: 85 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Backslopes
Slope range: 20 to 65 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Somewhat excessively drained
Parent material: Loamy slope alluvium over sandy residuum
Flooding: None
Depth to wet zone: More than 2.0 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 3.0 inches
Content of organic matter in the upper 10 inches: 1.9 percent
Typical profile:
Oe—0 to 1 inch; moderately decomposed plant material
A—1 to 4 inches; sandy loam
Bw1—4 to 18 inches; channery sandy loam
2Bw2—18 to 24 inches; very channery loamy sand
2Cr—24 to 40 inches; weathered bedrock

Minor Dissimilar Components

Basco and similar soils
Extent: 0 to 10 percent of the unit

Brownchurch and similar soils
Extent: 0 to 10 percent of the unit

253C2—Greenridge silt loam, 4 to 12 percent slopes, moderately eroded

Component Description

Greenridge and similar soils
Extent: 85 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and summits
Slope range: 4 to 12 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 45 to 80 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Loess over loamy residuum
Flooding: None
Depth to wet zone: More than 5.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.6 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 9 inches; silt loam
Bt—9 to 50 inches; silt loam
2Bt—50 to 69 inches; fine sandy loam
2Cr—69 to 80 inches; weathered bedrock

Minor Dissimilar Components

Norden and similar soils
Extent: 0 to 15 percent of the unit

254C2—Norden silt loam, 6 to 12 percent slopes, moderately eroded

Component Description

Norden and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 6 to 12 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Loess over loamy residuum
Flooding: None
Depth to wet zone: More than 3.1 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 6.6 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
Ap—0 to 8 inches; silt loam
Bt—8 to 20 inches; silt loam
2Bt—20 to 37 inches; fine sandy loam
2Cr—37 to 60 inches; weathered bedrock

Minor Dissimilar Components

Urne and similar soils
Extent: 0 to 5 percent of the unit

Greenridge and similar soils
Extent: 0 to 5 percent of the unit

Rockbridge and similar soils
Extent: 0 to 5 percent of the unit

254D2—Norden silt loam, 12 to 20 percent slopes, moderately eroded

Component Description

Norden and similar soils
Extent: 85 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 12 to 20 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Loess over loamy residuum
Flooding: None
Depth to wet zone: More than 3.1 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 6.6 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
Ap—0 to 8 inches; silt loam
Bt—8 to 20 inches; silt loam
2Bt—20 to 37 inches; fine sandy loam
2Cr—37 to 60 inches; weathered bedrock

Minor Dissimilar Components

Urne and similar soils
Extent: 0 to 10 percent of the unit

Greenridge and similar soils
Extent: 0 to 10 percent of the unit

Rockbridge and similar soils
Extent: 0 to 5 percent of the unit

254E2—Norden silt loam, 20 to 30 percent slopes, moderately eroded

Component Description

Norden and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 20 to 30 percent

Texture of the surface layer: Silt loam
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Loess over loamy residuum
Flooding: None
Depth to wet zone: More than 3.1 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 6.6 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
Ap—0 to 8 inches; silt loam
Bt—8 to 20 inches; silt loam
2Bt—20 to 37 inches; fine sandy loam
2Cr—37 to 60 inches; weathered bedrock

Minor Dissimilar Components

Urne and similar soils
Extent: 0 to 10 percent of the unit

Churchtown and similar soils
Extent: 0 to 5 percent of the unit

Greenridge and similar soils
Extent: 0 to 5 percent of the unit

255E2—Urne fine sandy loam, 20 to 30 percent slopes, moderately eroded

Component Description

Urne and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 20 to 30 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Loamy slope alluvium over loamy residuum
Flooding: None
Depth to wet zone: More than 3.0 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.7 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 9 inches; fine sandy loam
Bw1,Bw2—9 to 28 inches; fine sandy loam
Bw3—28 to 36 inches; fine sandy loam
Cr—36 to 60 inches; weathered bedrock

Minor Dissimilar Components

Norden and similar soils
Extent: 0 to 10 percent of the unit

Council and similar soils
Extent: 0 to 5 percent of the unit

Urne soils that are shallow
Extent: 0 to 5 percent of the unit

255F—Urne fine sandy loam, 30 to 45 percent slopes

Component Description

Urne and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 30 to 45 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Loamy slope alluvium over loamy residuum
Flooding: None
Depth to wet zone: More than 3.0 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.6 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
A—0 to 2 inches; fine sandy loam
Bw1,Bw2—2 to 28 inches; fine sandy loam
Bw3—28 to 36 inches; fine sandy loam
Cr—36 to 60 inches; weathered bedrock

Minor Dissimilar Components

Norden and similar soils
Extent: 0 to 5 percent of the unit

Rockbluff and similar soils
Extent: 0 to 5 percent of the unit

Council and similar soils
Extent: 0 to 5 percent of the unit

Urne soils that are shallow
Extent: 0 to 5 percent of the unit

264C2—Rockbridge silt loam, 6 to 12 percent slopes, moderately eroded

Component Description

Rockbridge and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 6 to 12 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 60 to 80 inches to bedrock (paralithic)

Drainage class: Well drained
Parent material: Loess over pedisediment over loamy residuum
Flooding: None
Depth to wet zone: More than 5.8 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 8.7 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 6 inches; silt loam
E—6 to 8 inches; silt loam
Bt—8 to 20 inches; silt loam
2Bt—20 to 35 inches; very gravelly silty clay loam
2BC—35 to 62 inches; very gravelly sandy loam
3C—62 to 70 inches; fine sandy loam
3Cr—70 to 80 inches; weathered bedrock

Minor Dissimilar Components

Norden and similar soils
Extent: 0 to 10 percent of the unit

Greenridge and similar soils
Extent: 0 to 5 percent of the unit

264D2—Rockbridge silt loam, 12 to 20 percent slopes, moderately eroded

Component Description

Rockbridge and similar soils
Extent: 85 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 12 to 20 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 60 to 80 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Loess over pedisediment over loamy residuum
Flooding: None
Depth to wet zone: More than 5.8 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 8.7 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 6 inches; silt loam
E—6 to 8 inches; silt loam
Bt—8 to 20 inches; silt loam
2Bt—20 to 35 inches; very gravelly silty clay loam
2BC—35 to 62 inches; very gravelly sandy loam
3C—62 to 70 inches; fine sandy loam
3Cr—70 to 80 inches; weathered bedrock

Minor Dissimilar Components

Norden and similar soils
Extent: 0 to 10 percent of the unit

Urne and similar soils
Extent: 0 to 10 percent of the unit

270B2—Port Byron silt loam, 2 to 6 percent slopes, moderately eroded

Component Description

Port Byron and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Summits
Slope range: 2 to 6 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.6 inches
Content of organic matter in the upper 10 inches: 3.5 percent
Typical profile:
Ap—0 to 11 inches; silt loam
AB—11 to 14 inches; silt loam
Bt1,Bt2—14 to 32 inches; silt loam
Bt3,Bt4—32 to 62 inches; silt loam
BC—62 to 80 inches; silt loam

Minor Dissimilar Components

Barremills and similar soils
Extent: 0 to 10 percent of the unit

270C2—Port Byron silt loam, 6 to 12 percent slopes, moderately eroded

Component Description

Port Byron and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders
Slope range: 6 to 12 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.6 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Typical profile:
Ap—0 to 11 inches; silt loam
AB—11 to 14 inches; silt loam
Bt1,Bt2—14 to 32 inches; silt loam
Bt3,Bt4—32 to 62 inches; silt loam
BC—62 to 80 inches; silt loam

Minor Dissimilar Components

Barremills and similar soils
Extent: 0 to 10 percent of the unit

284C2—Gillingham loamy fine sand, 6 to 12 percent slopes, moderately eroded

Component Description

Gillingham and similar soils
Extent: 85 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: 40 to 60 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Eolian sands over loamy slope alluvium over loamy residuum
Flooding: None
Depth to wet zone: More than 4.3 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.5 inches
Content of organic matter in the upper 10 inches: 0.7 percent
Typical profile:
Ap—0 to 8 inches; loamy fine sand
Bw—8 to 29 inches; loamy fine sand
2Bt1—29 to 42 inches; fine sandy loam
3Bt2—42 to 50 inches; fine sandy loam
3Cr—50 to 80 inches; weathered bedrock

Minor Dissimilar Components

Windward and similar soils
Extent: 0 to 10 percent of the unit

Norden and similar soils
Extent: 0 to 10 percent of the unit

284D2—Gillingham loamy fine sand, 12 to 20 percent slopes, moderately eroded

Component Description

Gillingham and similar soils
Extent: 85 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 12 to 20 percent

Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: 40 to 60 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Eolian sands over loamy slope alluvium over loamy residuum
Flooding: None
Depth to wet zone: More than 4.3 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.5 inches
Content of organic matter in the upper 10 inches: 0.7 percent
Typical profile:
Ap—0 to 8 inches; loamy fine sand
Bw—8 to 29 inches; loamy fine sand
2Bt1—29 to 42 inches; fine sandy loam
3Bt2—42 to 50 inches; fine sandy loam
3Cr—50 to 80 inches; weathered bedrock

Minor Dissimilar Components

Windward and similar soils
Extent: 0 to 10 percent of the unit

Norden and similar soils
Extent: 0 to 10 percent of the unit

293B2—Muscoda loamy fine sand, 1 to 6 percent slopes, moderately eroded

Component Description

Muscoda and similar soils
Extent: 85 to 100 percent of the unit
Geomorphic setting: Strath terraces
Geomorphic component: Treads
Slope range: 1 to 6 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: 40 to 60 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Sandy outwash over loamy alluvium over loamy residuum
Flooding: None
Depth to wet zone: More than 4.2 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.0 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 9 inches; loamy fine sand
E—9 to 16 inches; loamy fine sand
E and Bt—16 to 32 inches; stratified sand to loamy fine sand
2Bt—32 to 40 inches; gravelly sandy loam
3Bt—40 to 50 inches; fine sandy loam
3Cr—50 to 80 inches; weathered bedrock

Minor Dissimilar Components

Nuxmaruhanixete and similar soils
Extent: 0 to 10 percent of the unit

Chelsea and similar soils
Extent: 0 to 10 percent of the unit

293C2—Muscoda loamy fine sand, 6 to 12 percent slopes, moderately eroded

Component Description

Muscoda and similar soils
Extent: 85 to 100 percent of the unit
Geomorphic setting: Scarps on strath terraces
Slope range: 6 to 12 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: 40 to 60 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Sandy outwash over loamy alluvium over loamy residuum
Flooding: None
Depth to wet zone: More than 4.2 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.0 inches
Content of organic matter in the upper 10 inches: 1.4 percent
Typical profile:
Ap—0 to 9 inches; loamy fine sand
E—9 to 16 inches; loamy fine sand
E and Bt—16 to 32 inches; stratified sand to loamy fine sand
2Bt—32 to 40 inches; gravelly sandy loam
3Bt—40 to 50 inches; fine sandy loam
3Cr—50 to 80 inches; weathered bedrock

Minor Dissimilar Components

Nuxmaruhanixete and similar soils
Extent: 0 to 10 percent of the unit

Chelsea and similar soils
Extent: 0 to 10 percent of the unit

293D2—Muscoda loamy fine sand, 12 to 20 percent slopes, moderately eroded

Component Description

Muscoda and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Scarps on strath terraces
Slope range: 12 to 20 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: 40 to 60 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Sandy outwash over loamy alluvium over loamy residuum
Flooding: None
Depth to wet zone: More than 4.2 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.0 inches
Content of organic matter in the upper 10 inches: 1.4 percent

Typical profile:
Ap—0 to 9 inches; loamy fine sand
E—9 to 16 inches; loamy fine sand
E and Bt—16 to 32 inches; stratified sand to loamy fine sand
2Bt—32 to 40 inches; gravelly sandy loam
3Bt—40 to 50 inches; fine sandy loam
3Cr—50 to 80 inches; weathered bedrock

Minor Dissimilar Components

Chelsea and similar soils
Extent: 0 to 5 percent of the unit

Nuxmaruhanixete and similar soils
Extent: 0 to 5 percent of the unit

312B2—Festina silt loam, 2 to 6 percent slopes, moderately eroded

Component Description

Festina and similar soils
Extent: 100 percent of the unit
Geomorphic setting: Stream terraces
Geomorphic component: Treads
Slope range: 2 to 6 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Silty alluvium
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.7 inches
Content of organic matter in the upper 10 inches: 2.6 percent
Typical profile:
Ap—0 to 7 inches; silt loam
E—7 to 12 inches; silt loam
BE,Bt—12 to 38 inches; silt loam
BC,C—38 to 68 inches; silt loam

318A—Bearpen silt loam, 0 to 3 percent slopes, rarely flooded

Component Description

Bearpen and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Stream terraces
Geomorphic component: Treads
Slope range: 0 to 3 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Silty alluvium over silty to sandy slackwater deposits

Months in which flooding does not occur: January, February, November, December
Highest frequency of flooding: Rare (March, April, May, June, July, August, September, October)
Shallowest depth to wet zone: 1.5 feet (March, April, May, June, October, November, December)
Deepest depth to wet zone: More than 6.7 feet (January, February, July, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.4 inches
Content of organic matter in the upper 10 inches: 2.5 percent
Typical profile:
Ap—0 to 18 inches; silt loam
Bt—18 to 41 inches; silt loam
2Bt—41 to 50 inches; stratified silty clay loam to sandy loam
2C—50 to 60 inches; stratified silty clay loam to sandy loam

Minor Dissimilar Components

Ettrick and similar soils
Extent: 0 to 5 percent of the unit

Toddville and similar soils
Extent: 0 to 5 percent of the unit

Orion and similar soils
Extent: 0 to 5 percent of the unit

326B2—Medary silt loam, 1 to 6 percent slopes, moderately eroded

Component Description

Medary and similar soils
Extent: 95 to 100 percent of the unit
Geomorphic setting: Stream terraces
Geomorphic component: Treads
Slope range: 1 to 6 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loess and silty alluvium over stratified silty to clayey slackwater deposits
Flooding: None
Shallowest depth to wet zone: 3.0 feet (May, October)
Deepest depth to wet zone: More than 6.7 feet (January, February, July, August, September, December)
Ponding: None
Available water capacity to a depth of 60 inches: 9.9 inches
Content of organic matter in the upper 10 inches: 1.3 percent
Typical profile:
Ap—0 to 7 inches; silt loam
BE—7 to 14 inches; silt loam
2Bt—14 to 30 inches; stratified clay to silty clay loam
2C—30 to 60 inches; stratified clay to silt loam

Minor Dissimilar Components

Festina and similar soils
Extent: 0 to 5 percent of the unit

Bearpen and similar soils
Extent: 0 to 5 percent of the unit

336A—Toddville silt loam, 0 to 3 percent slopes

Component Description

Toddville and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Stream terraces
Geomorphic component: Treads
Slope range: 0 to 3 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Silty alluvium over sandy and loamy alluvium
Flooding: None
Shallowest depth to wet zone: 4.0 feet (March, April, May, October, November, December)
Deepest depth to wet zone: More than 6.7 feet (January, February, June, July, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 10.6 inches
Content of organic matter in the upper 10 inches: 3.0 percent
Typical profile:
Ap,AB—0 to 20 inches; silt loam
Bt—20 to 41 inches; silt loam
2Bt—41 to 50 inches; stratified silt loam to sandy loam
C—50 to 60 inches; stratified sand to loamy fine sand

Minor Dissimilar Components

Merimod and similar soils
Extent: 0 to 10 percent of the unit

Bearpen and similar soils
Extent: 0 to 5 percent of the unit

403A—Dakota silt loam, 0 to 3 percent slopes

Component Description

Dakota and similar soils
Extent: 95 to 100 percent of the unit
Geomorphic setting: Valley trains
Geomorphic component: Treads
Slope range: 0 to 3 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Silty alluvium over sandy and gravelly outwash
Flooding: None

Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 8.0 inches
Content of organic matter in the upper 10 inches: 3.5 percent
Typical profile:
Ap—0 to 10 inches; silt loam
AB—10 to 13 inches; silt loam
Bt—13 to 35 inches; silt loam
2Bt—35 to 38 inches; loamy sand
2C—38 to 60 inches; stratified gravelly coarse sand to sand

Minor Dissimilar Components

Rasset and similar soils
Extent: 0 to 10 percent of the unit

Dakota soils that have a loamy substratum
Extent: 0 to 5 percent of the unit

413A—Rasset sandy loam, 0 to 3 percent slopes

Component Description

Rasset and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Valley trains
Geomorphic component: Treads
Slope range: 0 to 3 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy alluvium over sandy and gravelly outwash
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 6.9 inches
Content of organic matter in the upper 10 inches: 3.0 percent
Typical profile:
Ap—0 to 10 inches; sandy loam
A,AB—10 to 18 inches; sandy loam
Bt—18 to 30 inches; sandy loam
2Bt,2BC—30 to 50 inches; loamy sand
2C—50 to 60 inches; stratified gravelly coarse sand to sand

Minor Dissimilar Components

Dakota and similar soils
Extent: 0 to 5 percent of the unit

Burkhardt and similar soils
Extent: 0 to 5 percent of the unit

Finchford and similar soils
Extent: 0 to 5 percent of the unit

Rasset soils that have a loamy substratum
Extent: 0 to 5 percent of the unit

Sparta and similar soils
Extent: 0 to 5 percent of the unit

424B—Merit silt loam, 1 to 6 percent slopes

Component Description

Merit and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Stream terraces
Geomorphic component: Treads
Slope range: 1 to 6 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Silty alluvium over sandy and loamy alluvium
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.7 inches
Content of organic matter in the upper 10 inches: 2.4 percent
Typical profile:
Ap—0 to 9 inches; silt loam
Bt—9 to 12 inches; silt loam
2Bt—12 to 30 inches; loam
3C—30 to 60 inches; stratified sand to fine sandy loam

Minor Dissimilar Components

Merimod and similar soils
Extent: 0 to 10 percent of the unit

Bilson and similar soils
Extent: 0 to 5 percent of the unit

424D2—Merit silt loam, 12 to 20 percent slopes, moderately eroded

Component Description

Merit and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Stream terraces
Geomorphic component: Risers
Slope range: 12 to 20 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Silty alluvium over sandy and loamy alluvium
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.7 inches
Content of organic matter in the upper 10 inches: 2.4 percent

Typical profile:
Ap—0 to 9 inches; silt loam
Bt—9 to 12 inches; silt loam
2Bt—12 to 30 inches; loam
3C—30 to 60 inches; stratified sand to fine sandy loam

Minor Dissimilar Components

Bilson and similar soils
Extent: 5 to 15 percent of the unit

424F—Merit silt loam, 20 to 45 percent slopes

Component Description

Merit and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Stream terraces
Geomorphic component: Risers
Slope range: 20 to 45 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Silty alluvium over sandy and loamy alluvium
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.5 inches
Content of organic matter in the upper 10 inches: 2.1 percent
Typical profile:
A—0 to 3 inches; silt loam
Bt—3 to 12 inches; silt loam
2Bt—12 to 30 inches; loam
3C—30 to 60 inches; stratified sand to fine sandy loam

Minor Dissimilar Components

Bilson and similar soils
Extent: 0 to 10 percent of the unit

Seep areas
Extent: 0 to 5 percent of the unit

433B—Forkhorn sandy loam, 2 to 6 percent slopes

Component Description

Forkhorn and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Valley trains
Geomorphic component: Treads
Slope range: 2 to 6 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy alluvium over sandy and gravelly outwash
Flooding: None

Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.3 inches
Content of organic matter in the upper 10 inches: 2.4 percent
Typical profile:
Ap—0 to 9 inches; sandy loam
Bt—9 to 25 inches; sandy loam
2Bt—25 to 32 inches; gravelly loamy sand
2BC,2C—32 to 72 inches; stratified gravelly coarse sand to sand

Minor Dissimilar Components

Rusktown and similar soils
Extent: 0 to 5 percent of the unit

Plainfield and similar soils
Extent: 0 to 10 percent of the unit

Silverhill and similar soils
Extent: 0 to 5 percent of the unit

434B—Bilson sandy loam, 1 to 6 percent slopes

Component Description

Bilson and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Stream terraces
Geomorphic component: Treads
Slope range: 1 to 6 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy alluvium over sandy and loamy alluvium
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.0 inches
Content of organic matter in the upper 10 inches: 2.1 percent
Typical profile:
Ap—0 to 8 inches; sandy loam
Bt—8 to 32 inches; sandy loam
2C1—32 to 38 inches; stratified sand to loamy sand
2C2—38 to 60 inches; stratified sand to sandy loam

Minor Dissimilar Components

Elevasil and similar soils
Extent: 0 to 5 percent of the unit

Bilmod and similar soils
Extent: 0 to 7 percent of the unit

Gosil and similar soils
Extent: 0 to 5 percent of the unit

Merimod and similar soils
Extent: 0 to 3 percent of the unit

434C2—Bilson sandy loam, 6 to 12 percent slopes, moderately eroded

Component Description

Bilson and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Pediments
Position on the landform: Footslopes
Slope range: 6 to 12 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy alluvium over sandy and loamy alluvium
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.0 inches
Content of organic matter in the upper 10 inches: 2.1 percent
Typical profile:
Ap—0 to 8 inches; sandy loam
Bt—8 to 32 inches; sandy loam
2C1—32 to 38 inches; stratified sand to loamy sand
2C2—38 to 60 inches; stratified sand to sandy loam

Minor Dissimilar Components

Gosil and similar soils
Extent: 0 to 15 percent of the unit

Bilmod and similar soils
Extent: 0 to 5 percent of the unit

435B2—Nuxmaruhanixete silt loam, 1 to 6 percent slopes, moderately eroded

Component Description

Nuxmaruhanixete and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Strath terraces
Geomorphic component: Treads
Slope range: 1 to 6 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Silty alluvium over loamy alluvium over sandy outwash
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 8.7 inches
Content of organic matter in the upper 10 inches: 3.5 percent
Typical profile:
Ap—0 to 11 inches; silt loam
BE—11 to 14 inches; silt loam

Bt—14 to 26 inches; silt loam
2Bt—26 to 52 inches; very gravelly loam
3BC—52 to 60 inches; stratified very gravelly coarse sand to gravelly loamy sand

Minor Dissimilar Components

Balmoral and similar soils
Extent: 0 to 10 percent of the unit

Muscoda and similar soils
Extent: 0 to 5 percent of the unit

435C2—Nuxmaruhanixete silt loam, 6 to 12 percent slopes, moderately eroded

Component Description

Nuxmaruhanixete and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Scarps on strath terraces
Slope range: 6 to 12 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Silty alluvium over loamy alluvium over sandy outwash
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 8.7 inches
Content of organic matter in the upper 10 inches: 3.5 percent
Typical profile:
Ap—0 to 11 inches; silt loam
BE—11 to 14 inches; silt loam
Bt—14 to 26 inches; silt loam
2Bt—26 to 52 inches; very gravelly loam
3BC—52 to 60 inches; stratified very gravelly coarse sand to gravelly loamy sand

Minor Dissimilar Components

Balmoral and similar soils
Extent: 0 to 10 percent of the unit

Muscoda and similar soils
Extent: 0 to 5 percent of the unit

437A—Balmoral silt loam, 0 to 3 percent slopes

Component Description

Balmoral and similar soils
Extent: 85 to 100 percent of the unit
Geomorphic setting: Drainageways on strath terraces
Slope range: 0 to 3 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Silty alluvium over loamy alluvium over sandy outwash

Flooding: None
Shallowest depth to wet zone: 2.0 feet (April, May)
Deepest depth to wet zone: More than 6.7 feet (January, February, March, June, July, August, September, December)
Ponding: None
Available water capacity to a depth of 60 inches: 11.2 inches
Content of organic matter in the upper 10 inches: 3.5 percent
Typical profile:
Ap—0 to 16 inches; silt loam
BE—16 to 20 inches; silt loam
Bt—20 to 46 inches; silt loam
2Bt—46 to 66 inches; gravelly loam
3BC—66 to 70 inches; stratified very gravelly coarse sand to gravelly loamy sand

Minor Dissimilar Components

Nuxmaruhanixete and similar soils
Extent: 0 to 15 percent of the unit

Muscoda and similar soils
Extent: 0 to 5 percent of the unit

446A—Merimod silt loam, 0 to 3 percent slopes

Component Description

Merimod and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Stream terraces
Geomorphic component: Treads
Slope range: 0 to 3 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Silty alluvium over sandy and loamy alluvium
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April, May, October, November)
Deepest depth to wet zone: More than 6.7 feet (January, February, March, June, July, August, September, December)
Ponding: None
Available water capacity to a depth of 60 inches: 7.8 inches
Content of organic matter in the upper 10 inches: 2.4 percent
Typical profile:
Ap—0 to 9 inches; silt loam
Bt—9 to 17 inches; silt loam
2Bt—17 to 32 inches; loam
3C1—32 to 52 inches; stratified sand to loamy sand
3C2—52 to 60 inches; stratified sand to fine sandy loam

Minor Dissimilar Components

Merit and similar soils
Extent: 0 to 10 percent of the unit

Bilmod and similar soils
Extent: 0 to 5 percent of the unit

Toddville and similar soils
Extent: 0 to 5 percent of the unit

446B2—Merimod silt loam, 2 to 6 percent slopes, moderately eroded

Component Description

Merimod and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Stream terraces
Geomorphic component: Risers
Slope range: 2 to 6 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Silty alluvium over sandy and loamy alluvium
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April, May, October, November)
Deepest depth to wet zone: More than 6.7 feet (January, February, March, June, July, August, September, December)
Ponding: None
Available water capacity to a depth of 60 inches: 7.8 inches
Content of organic matter in the upper 10 inches: 2.4 percent
Typical profile:
Ap—0 to 9 inches; silt loam
Bt—9 to 17 inches; silt loam
2Bt—17 to 32 inches; loam
3C1—32 to 52 inches; stratified sand to loamy sand
3C2—52 to 60 inches; stratified sand to fine sandy loam

Minor Dissimilar Components

Merit and similar soils
Extent: 0 to 10 percent of the unit

Bilmod and similar soils
Extent: 0 to 5 percent of the unit

Toddville and similar soils
Extent: 0 to 5 percent of the unit

456A—Bilmod sandy loam, 0 to 3 percent slopes

Component Description

Bilmod and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Stream terraces
Geomorphic component: Treads
Slope range: 0 to 3 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy alluvium over sandy and loamy alluvium

Flooding: None
Shallowest depth to wet zone: 4.0 feet (April, May, October, November)
Deepest depth to wet zone: More than 6.7 feet (January, February, March, June, July, August, September, December)
Ponding: None
Available water capacity to a depth of 60 inches: 6.3 inches
Content of organic matter in the upper 10 inches: 2.3 percent
Typical profile:
Ap—0 to 9 inches; sandy loam
Bt—9 to 24 inches; sandy loam
2BC—24 to 32 inches; loamy sand
2C1—32 to 46 inches; stratified sand to loamy sand
2C2—46 to 60 inches; stratified sand to sandy loam

Minor Dissimilar Components

Bilson and similar soils
Extent: 0 to 10 percent of the unit

Merimod and similar soils
Extent: 0 to 5 percent of the unit

502B2—Chelsea fine sand, 2 to 6 percent slopes, moderately eroded

Component Description

Chelsea and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Dunes on valley trains
Slope range: 2 to 6 percent
Texture of the surface layer: Fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Eolian sands
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.5 inches
Content of organic matter in the upper 10 inches: 0.7 percent
Typical profile:
Ap—0 to 9 inches; fine sand
Bw—9 to 30 inches; fine sand
E and Bt—30 to 80 inches; stratified fine sand to fine sandy loam

Minor Dissimilar Components

Finchford and similar soils
Extent: 0 to 10 percent of the unit

Rasset and similar soils
Extent: 0 to 5 percent of the unit

Sparta and similar soils
Extent: 0 to 10 percent of the unit

502C2—Chelsea fine sand, 6 to 15 percent slopes, moderately eroded

Component Description

Chelsea and similar soils
Extent: 95 to 100 percent of the unit
Geomorphic setting: Dunes on valley trains
Slope range: 6 to 15 percent
Texture of the surface layer: Fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Eolian sands
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.5 inches
Content of organic matter in the upper 10 inches: 0.7 percent
Typical profile:
Ap—0 to 9 inches; fine sand
Bw—9 to 30 inches; fine sand
E and Bt—30 to 80 inches; stratified fine sand to fine sandy loam

Minor Dissimilar Components

Finchford and similar soils
Extent: 0 to 5 percent of the unit

Sparta and similar soils
Extent: 0 to 5 percent of the unit

504A—Sparta loamy fine sand, 0 to 3 percent slopes

Component Description

Sparta and similar soils
Extent: 85 to 100 percent of the unit
Geomorphic setting: Valley trains
Geomorphic component: Treads
Slope range: 0 to 3 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy outwash
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.0 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
Ap—0 to 11 inches; loamy fine sand
AB—11 to 15 inches; loamy fine sand
Bw—15 to 72 inches; fine sand
E and Bt—72 to 80 inches; stratified sand to loamy fine sand

Minor Dissimilar Components

Rasset and similar soils
Extent: 0 to 10 percent of the unit

Chelsea and similar soils
Extent: 0 to 5 percent of the unit

506A—Komro loamy sand, 0 to 3 percent slopes

Component Description

Komro and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Valley trains
Geomorphic component: Treads
Slope range: 0 to 3 percent
Texture of the surface layer: Loamy sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Sandy and gravelly outwash
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April, May, June, November)
Deepest depth to wet zone: 5.5 feet (August)
Ponding: None
Available water capacity to a depth of 60 inches: 4.4 inches
Content of organic matter in the upper 10 inches: 2.0 percent
Typical profile:
Ap,A—0 to 14 inches; loamy sand
AB—14 to 18 inches; sand
Bw—18 to 38 inches; sand
C—38 to 72 inches; stratified sand to very gravelly coarse sand

Minor Dissimilar Components

Farrington and similar soils
Extent: 1 to 10 percent of the unit

Finchford and similar soils
Extent: 1 to 5 percent of the unit

Komro soils that have a loamy substratum
Extent: 1 to 5 percent of the unit

508A—Farrington loamy sand, 0 to 3 percent slopes

Component Description

Farrington and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Valley trains
Geomorphic component: Treads
Slope range: 0 to 3 percent
Texture of the surface layer: Loamy sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Sandy outwash

Flooding: None
Shallowest depth to wet zone: 1.5 feet (April, May, June)
Deepest depth to wet zone: 3.0 feet (July, August)
Ponding: None
Available water capacity to a depth of 60 inches: 4.2 inches
Content of organic matter in the upper 10 inches: 2.0 percent
Typical profile:
Ap,A—0 to 14 inches; loamy sand
AB—14 to 18 inches; loamy sand
Bw—18 to 41 inches; loamy sand
C—41 to 72 inches; coarse sand

Minor Dissimilar Components

Komro and similar soils
Extent: 1 to 10 percent of the unit

Newson and similar soils
Extent: 0 to 5 percent of the unit

511C—Plainfield sand, 6 to 15 percent slopes

Component Description

Plainfield and similar soils
Extent: 95 to 100 percent of the unit
Geomorphic setting: Valley trains
Geomorphic component: Risers
Slope range: 6 to 15 percent
Texture of the surface layer: Sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy and gravelly outwash
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 3.7 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
Ap—0 to 9 inches; sand
Bw—9 to 32 inches; sand
C—32 to 80 inches; stratified gravelly coarse sand to sand

Minor Dissimilar Components

Boplain and similar soils
Extent: 0 to 5 percent of the unit

511F—Plainfield sand, 15 to 60 percent slopes

Component Description

Plainfield and similar soils
Extent: 95 to 100 percent of the unit
Geomorphic setting: Valley trains
Geomorphic component: Risers

Slope range: 15 to 60 percent
Texture of the surface layer: Sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy and gravelly outwash
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 4.3 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
Oe—0 to 1 inch; moderately decomposed plant material
A—1 to 4 inches; sand
Bw—4 to 32 inches; sand
C—32 to 80 inches; stratified gravelly coarse sand to sand

Minor Dissimilar Components

Boplain and similar soils
Extent: 0 to 5 percent of the unit

Seep areas
Extent: 0 to 5 percent of the unit

568A—Majik loamy fine sand, 0 to 3 percent slopes

Component Description

Majik and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Depressions on stream terraces
Slope range: 0 to 3 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Sandy alluvium
Flooding: None
Shallowest depth to wet zone: 1.5 feet (April, May, June)
Deepest depth to wet zone: 3.0 feet (July, August)
Ponding: None
Available water capacity to a depth of 60 inches: 4.3 inches
Content of organic matter in the upper 10 inches: 1.6 percent
Typical profile:
A—0 to 4 inches; loamy fine sand
E—4 to 7 inches; sand
Bw,BC—7 to 29 inches; loamy fine sand
C—29 to 60 inches; fine sand

Minor Dissimilar Components

Tint and similar soils
Extent: 0 to 10 percent of the unit

Newlang and similar soils
Extent: 0 to 5 percent of the unit

572B2—Windward loamy fine sand, 2 to 6 percent slopes, moderately eroded

Component Description

Windward and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Toeslopes
Slope range: 2 to 6 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Parent material: Eolian sands
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.0 inches
Content of organic matter in the upper 10 inches: 0.7 percent
Typical profile:
Ap—0 to 9 inches; loamy fine sand
Bw—9 to 30 inches; loamy fine sand
E and Bt—30 to 46 inches; stratified fine sand to fine sandy loam
C—46 to 80 inches; fine sand

Minor Dissimilar Components

Gillingham and similar soils
Extent: 0 to 10 percent of the unit

Bilson and similar soils
Extent: 0 to 5 percent of the unit

572C2—Windward loamy fine sand, 6 to 12 percent slopes, moderately eroded

Component Description

Windward and similar soils
Extent: 90 to 100 percent of the unit
Geomorphic setting: Hills
Position on the landform: Footslopes
Slope range: 6 to 12 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Parent material: Eolian sands
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.0 inches
Content of organic matter in the upper 10 inches: 0.7 percent
Typical profile:
Ap—0 to 9 inches; loamy fine sand
Bw—9 to 30 inches; loamy fine sand

E and Bt—30 to 46 inches; stratified fine sand to fine sandy loam
C—46 to 80 inches; fine sand

Minor Dissimilar Components

Gillingham and similar soils
Extent: 0 to 5 percent of the unit

Bilson and similar soils
Extent: 0 to 10 percent of the unit

576B—Tintson sand, 1 to 6 percent slopes

Component Description

Tintson and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Pediments
Position on the landform: Footslopes
Slope range: 1 to 6 percent
Texture of the surface layer: Sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Sandy alluvium over loamy alluvium
Flooding: None
Shallowest depth to wet zone: 3.0 feet (May, October)
Deepest depth to wet zone: More than 6.7 feet (January, February, July, August, September, December)
Ponding: None
Available water capacity to a depth of 60 inches: 5.8 inches
Content of organic matter in the upper 10 inches: 1.1 percent
Typical profile:
Ap—0 to 8 inches; sand
Bw,BC,C—8 to 46 inches; sand
2C—46 to 60 inches; stratified silt loam to sandy loam

Minor Dissimilar Components

Gosil and similar soils
Extent: 0 to 10 percent of the unit

Bilmod and similar soils
Extent: 0 to 5 percent of the unit

Majik and similar soils
Extent: 0 to 5 percent of the unit

601C—Beavercreek cobbly fine sandy loam, 3 to 12 percent slopes, occasionally flooded

Component Description

Beavercreek and similar soils
Extent: 95 to 100 percent of the unit
Geomorphic setting: Alluvial fans
Slope range: 3 to 12 percent
Texture of the surface layer: Cobbly fine sandy loam

Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Cobbly loamy alluvium and colluvium
Lowest frequency of flooding (if it occurs): Rare (January, February, June, July, August, September, December)
Highest frequency of flooding: Occasional (March, April, May, October, November)
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 6.5 inches
Content of organic matter in the upper 10 inches: 1.1 percent
Typical profile:
A—0 to 5 inches; cobbly fine sandy loam
C1—5 to 12 inches; stratified cobbly fine sandy loam to silt loam
2C2—12 to 60 inches; stratified very cobbly silt loam to extremely gravelly sand

Minor Dissimilar Components

Arenzville and similar soils
Extent: 0 to 5 percent of the unit

626A—Arenzville silt loam, 0 to 3 percent slopes, occasionally flooded

Component Description

Arenzville and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Drainageways on stream terraces
Slope range: 0 to 3 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Silty alluvium
Lowest frequency of flooding (if it occurs): Rare (January, February, July, August, September, December)
Highest frequency of flooding: Occasional (March, April, May, June, October, November)
Shallowest depth to wet zone: 4.0 feet (April, May, June, November)
Deepest depth to wet zone: 5.5 feet (August)
Ponding: None
Available water capacity to a depth of 60 inches: 12.5 inches
Content of organic matter in the upper 10 inches: 2.0 percent
Typical profile:
A—0 to 10 inches; silt loam
C—10 to 25 inches; silt loam
Ab—25 to 40 inches; silt loam
C´—40 to 60 inches; stratified silt loam to very fine sand

Minor Dissimilar Components

Soils that are not subject to flooding
Extent: 0 to 5 percent of the unit

Orion and similar soils
Extent: 0 to 5 percent of the unit

Ettrick and similar soils
Extent: 0 to 2 percent of the unit

Arenzville, loamy-skeletal substratum, and similar soils
Extent: 0 to 10 percent of the unit

628A—Orion silt loam, 0 to 3 percent slopes, occasionally flooded

Component Description

Orion and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Drainageways on stream terraces
Slope range: 0 to 3 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Silty alluvium
Lowest frequency of flooding (if it occurs): Rare (January, February, July, August, September, December)
Highest frequency of flooding: Occasional (March, April, May, June, October, November)
Shallowest depth to wet zone: 1.5 feet (April, May, June)
Deepest depth to wet zone: 3.0 feet (July, August)
Ponding: None
Available water capacity to a depth of 60 inches: 12.4 inches
Content of organic matter in the upper 10 inches: 2.0 percent
Typical profile:
Ap—0 to 8 inches; silt loam
C—8 to 32 inches; silt loam
Ab—32 to 40 inches; silt loam
Cg—40 to 60 inches; stratified silt loam to very fine sand

Minor Dissimilar Components

Arenzville and similar soils
Extent: 0 to 10 percent of the unit

Ettrick and similar soils
Extent: 1 to 5 percent of the unit

Soils that are not subject to flooding
Extent: 1 to 5 percent of the unit

Orion, loamy-skeletal substratum, and similar soils
Extent: 0 to 5 percent of the unit

629A—Ettrick silt loam, 0 to 2 percent slopes, frequently flooded

Component Description

Ettrick and similar soils
Extent: 85 to 100 percent of the unit
Geomorphic setting: Drainageways on stream terraces

Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Silty alluvium
Lowest frequency of flooding (if it occurs): Rare (January, December)
Highest frequency of flooding: Frequent (March, April, May)
Shallowest depth to wet zone: At the surface (March, April, May, November)
Deepest depth to wet zone: 2.0 feet (August)
Shallowest ponding: 0.3 foot (January, February, June, July, August, September, October, December)
Deepest ponding: 0.5 foot (March, April, May, November)
Available water capacity to a depth of 60 inches: 14.4 inches
Content of organic matter in the upper 10 inches: 8.0 percent
Typical profile:
Ap,A—0 to 16 inches; silt loam
Bg—16 to 35 inches; silt loam
Cg—35 to 60 inches; stratified silt loam to fine sand

Minor Dissimilar Components

Orion and similar soils
Extent: 0 to 5 percent of the unit

Palms and similar soils
Extent: 0 to 5 percent of the unit

Ettrick, drained, and similar soils
Extent: 0 to 5 percent of the unit

656A—Scotah loamy fine sand, 0 to 3 percent slopes, occasionally flooded

Component Description

Scotah and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Natural levees and flats on flood plains
Slope range: 0 to 3 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Sandy alluvium
Lowest frequency of flooding (if it occurs): Very rare (January, August, September, October, November, December)
Highest frequency of flooding: Occasional (March, April, May)
Shallowest depth to wet zone: 4.0 feet (April, May, June, November)
Deepest depth to wet zone: 5.5 feet (August)
Ponding: None
Available water capacity to a depth of 60 inches: 4.3 inches
Content of organic matter in the upper 10 inches: 1.1 percent
Typical profile:
A—0 to 4 inches; loamy fine sand
Bw—4 to 22 inches; fine sand
C—22 to 60 inches; stratified loamy fine sand to gravelly coarse sand

Minor Dissimilar Components

Algansee and similar soils
Extent: 0 to 10 percent of the unit

Soils that are not subject to flooding
Extent: 0 to 5 percent of the unit

Kalmarville and similar soils
Extent: 0 to 5 percent of the unit

676A—Kickapoo fine sandy loam, 0 to 3 percent slopes, occasionally flooded

Component Description

Kickapoo and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Drainageways
Slope range: 0 to 3 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy alluvium
Lowest frequency of flooding (if it occurs): Rare (January, February, July, August, September, December)
Highest frequency of flooding: Occasional (March, April, May, June, October, November)
Shallowest depth to wet zone: 4.0 feet (April, May, June, November)
Deepest depth to wet zone: 5.5 feet (August)
Ponding: None
Available water capacity to a depth of 60 inches: 8.5 inches
Content of organic matter in the upper 10 inches: 1.5 percent
Typical profile:
Ap—0 to 5 inches; fine sandy loam
C—5 to 36 inches; stratified gravelly sand to silt
Ab—36 to 41 inches; silt loam
C´—41 to 60 inches; stratified gravelly loamy sand to silt

Minor Dissimilar Components

Kickapoo soils that are not subject to flooding
Extent: 0 to 10 percent of the unit

Beavercreek and similar soils
Extent: 0 to 4 percent of the unit

743C2—Council fine sandy loam, 6 to 12 percent slopes, moderately eroded

Component Description

Council and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Footslopes

Slope range: 6 to 12 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy slope alluvium
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.0 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
Ap—0 to 7 inches; fine sandy loam
Bt—7 to 45 inches; loam
C—45 to 60 inches; silt loam

Minor Dissimilar Components

Norden and similar soils
Extent: 0 to 5 percent of the unit

Elevasil and similar soils
Extent: 0 to 5 percent of the unit

Seaton and similar soils
Extent: 0 to 5 percent of the unit

743D2—Council fine sandy loam, 12 to 20 percent slopes, moderately eroded

Component Description

Council and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Footslopes
Slope range: 12 to 20 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy slope alluvium
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.0 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
Ap—0 to 7 inches; fine sandy loam
Bt—7 to 45 inches; loam
C—45 to 60 inches; silt loam

Minor Dissimilar Components

Elevasil and similar soils
Extent: 0 to 5 percent of the unit

Norden and similar soils
Extent: 0 to 5 percent of the unit

Seaton and similar soils
Extent: 0 to 5 percent of the unit

743E2—Council fine sandy loam, 20 to 30 percent slopes, moderately eroded

Component Description

Council and similar soils
Extent: 85 to 95 percent of the unit
Geomorphic setting: Hills
Position on the landform: Footslopes
Slope range: 20 to 30 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy slope alluvium
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.0 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
Ap—0 to 7 inches; fine sandy loam
Bt—7 to 45 inches; loam
C—45 to 60 inches; silt loam

Minor Dissimilar Components

Elevasil and similar soils
Extent: 0 to 8 percent of the unit

Norden and similar soils
Extent: 0 to 5 percent of the unit

Seaton and similar soils
Extent: 0 to 5 percent of the unit

1125F—Dorerton, very stony-Elbaville complex, 30 to 60 percent slopes

Component Description

Dorerton and similar soils
Extent: 55 to 65 percent of the unit
Geomorphic setting: Hills
Position on the landform: Backslopes
Slope range: 30 to 60 percent
Texture of the surface layer: Loam
Depth to restrictive feature: 45 to 70 inches to bedrock (lithic)
Drainage class: Well drained
Parent material: Loamy colluvium over loamy residuum
Flooding: None
Depth to wet zone: More than 5.0 feet all year
Ponding: None

Available water capacity to a depth of 60 inches: 5.6 inches
Content of organic matter in the upper 10 inches: 2.1 percent
Typical profile:
A—0 to 3 inches; loam
E—3 to 15 inches; loam
BE,Bt—15 to 18 inches; loam
2Bt—18 to 30 inches; very channery clay loam
2C—30 to 60 inches; extremely flaggy loamy sand

Elbaville and similar soils
Extent: 20 to 30 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders
Slope range: 30 to 45 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 60 to 80 inches to bedrock (lithic)
Drainage class: Well drained
Parent material: Loess over loamy and clayey colluvium over loamy and sandy residuum
Flooding: None
Depth to wet zone: More than 5.0 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.5 inches
Content of organic matter in the upper 10 inches: 2.5 percent
Typical profile:
Oe—0 to 1 inch; moderately decomposed plant material
A—1 to 5 inches; silt loam
E—5 to 11 inches; silt loam
B/E,Bt—11 to 21 inches; silt loam
2Bt—21 to 26 inches; silty clay
3Bt—26 to 37 inches; very flaggy silty clay loam
3C—37 to 60 inches; extremely flaggy sandy loam

Minor Dissimilar Components

Churchtown and similar soils
Extent: 0 to 10 percent of the unit

Dorerton soils that are not stony
Extent: 0 to 5 percent of the unit

Gaphill and similar soils
Extent: 0 to 5 percent of the unit

Rockbluff and similar soils
Extent: 0 to 5 percent of the unit

1145F—Gaphill-Rockbluff complex, 30 to 60 percent slopes

Component Description

Gaphill and similar soils
Extent: 45 to 55 percent of the unit
Geomorphic setting: Hills
Position on the landform: Backslopes and shoulders
Slope range: 30 to 60 percent

Texture of the surface layer: Sandy loam
Depth to restrictive feature: 40 to 80 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Loamy colluvium and/or loamy slope alluvium over sandy colluvium and/or sandy residuum
Flooding: None
Depth to wet zone: More than 4.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 6.7 inches
Content of organic matter in the upper 10 inches: 2.2 percent
Typical profile:
Oe—0 to 2 inches; moderately decomposed plant material
A—2 to 5 inches; sandy loam
E—5 to 11 inches; sandy loam
Bt—11 to 32 inches; sandy loam
2BC—32 to 50 inches; sand
2C—50 to 56 inches; sand
2Cr—56 to 80 inches; weathered bedrock

Rockbluff and similar soils
Extent: 30 to 40 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 30 to 60 percent
Texture of the surface layer: Loamy sand
Depth to restrictive feature: 40 to 80 inches to bedrock (paralithic)
Drainage class: Excessively drained
Parent material: Sandy colluvium and/or sandy slope alluvium over sandy residuum
Flooding: None
Depth to wet zone: More than 4.3 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 4.6 inches
Content of organic matter in the upper 10 inches: 1.5 percent
Typical profile:
Oe—0 to 2 inches; moderately decomposed plant material
A—2 to 4 inches; loamy sand
E—4 to 9 inches; loamy sand
Bw—9 to 35 inches; sand
C—35 to 52 inches; sand
Cr—52 to 80 inches; weathered bedrock

Minor Dissimilar Components

Gaphill, very stony, and similar soils
Extent: 0 to 10 percent of the unit

Dorerton and similar soils
Extent: 0 to 5 percent of the unit

Brownchurch and similar soils
Extent: 0 to 5 percent of the unit

Rock outcrop
Extent: 0 to 3 percent of the unit

1155F—Brodale-Bellechester-Rock outcrop complex, 60 to 90 percent slopes

Component Description

Brodale and similar soils
Extent: 30 to 50 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders and backslopes
Slope range: 60 to 80 percent
Texture of the surface layer: Very flaggy loam
Depth to restrictive feature: 40 to 80 inches to bedrock (lithic)
Drainage class: Excessively drained
Parent material: Loamy colluvium over loamy residuum
Flooding: None
Depth to wet zone: More than 4.2 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 3.6 inches
Content of organic matter in the upper 10 inches: 3.2 percent
Typical profile:
A—0 to 6 inches; very flaggy loam
C—6 to 50 inches; very flaggy very fine sandy loam
R—50 to 80 inches; weathered bedrock

Bellechester and similar soils
Extent: 20 to 40 percent of the unit
Geomorphic setting: Hills
Position on the landform: Backslopes
Slope range: 60 to 90 percent
Texture of the surface layer: Sand
Depth to restrictive feature: 40 to 70 inches to bedrock (paralithic)
Drainage class: Excessively drained
Parent material: Sandy colluvium over sandy residuum
Flooding: None
Depth to wet zone: More than 3.5 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 3.0 inches
Content of organic matter in the upper 10 inches: 2.5 percent
Typical profile:
A1—0 to 7 inches; sand
A2,BA—7 to 23 inches; sand
Bw,BC—23 to 42 inches; sand
Cr—42 to 80 inches; weathered bedrock

Rock outcrop
Extent: 10 to 20 percent of the unit
Geomorphic setting: Hills
Position on the landform: Shoulders
Slope range: 60 to 90 percent
Flooding: None

Minor Dissimilar Components

Bellechester, very stony, and similar soils
Extent: 1 to 15 percent of the unit

Churchtown and similar soils
Extent: 1 to 5 percent of the unit

Talus slopes
Extent: 0 to 5 percent of the unit

1505C2—Sparta-Blownout land complex, 0 to 15 percent slopes

Component Description

Sparta and similar soils
Extent: 45 to 60 percent of the unit
Geomorphic setting: Valley trains
Geomorphic component: Treads
Slope range: 0 to 3 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy outwash
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.0 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
Ap—0 to 11 inches; loamy fine sand
AB—11 to 15 inches; loamy fine sand
Bw—15 to 72 inches; fine sand
E and Bt—72 to 80 inches; stratified sand to loamy fine sand

Blownout land
Extent: 40 to 60 percent of the unit
Geomorphic setting: Blowouts on valley trains
Slope range: 6 to 15 percent
Drainage class: Excessively drained
Parent material: Sandy outwash
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None

Minor Dissimilar Components

Chelsea and similar soils
Extent: 0 to 10 percent of the unit

Rasset and similar soils
Extent: 0 to 5 percent of the unit

1648A—Northbend-Ettrick silt loams, 0 to 3 percent slopes, frequently flooded

Component Description

Northbend and similar soils
Extent: 55 to 65 percent of the unit

Geomorphic setting: Flats on flood plains
Slope range: 0 to 3 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Silty and loamy alluvium over sandy alluvium
Lowest frequency of flooding (if it occurs): Very rare (January, February, August, December)
Highest frequency of flooding: Frequent (March, April, May, June)
Shallowest depth to wet zone: 1.5 feet (April, May, June)
Deepest depth to wet zone: 3.0 feet (July, August)
Ponding: None
Available water capacity to a depth of 60 inches: 8.3 inches
Content of organic matter in the upper 10 inches: 5.9 percent
Typical profile:
A—0 to 7 inches; silt loam
Bw—7 to 34 inches; silt loam
2BC—34 to 36 inches; loamy fine sand
2C—36 to 60 inches; sand

Ettrick and similar soils
Extent: 25 to 35 percent of the unit
Geomorphic setting: Drainageways and depressions on flood plains
Slope range: 0 to 1 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Silty alluvium
Lowest frequency of flooding (if it occurs): Very rare (January, February, August, December)
Highest frequency of flooding: Frequent (March, April, May, June)
Shallowest depth to wet zone: At the surface (January, February, March, April, May, June, October, November, December)
Deepest depth to wet zone: 1.5 feet (August)
Shallowest ponding: 0.3 foot (January, February, June, July, August, September, October, December)
Deepest ponding: 0.5 foot (March, April, May, November)
Available water capacity to a depth of 60 inches: 14.4 inches
Content of organic matter in the upper 10 inches: 8.0 percent
Typical profile:
A—0 to 16 inches; silt loam
Bg—16 to 35 inches; silt loam
Cg—35 to 60 inches; stratified fine sand to silt loam

Minor Dissimilar Components

Palms and similar soils
Extent: 1 to 10 percent of the unit

Dunnbot and similar soils
Extent: 0 to 5 percent of the unit

Water
Extent: 0 to 5 percent of the unit

1658A—Algansee-Kalmarville complex, 0 to 3 percent slopes, frequently flooded

Component Description

Algansee and similar soils
Extent: 50 to 60 percent of the unit
Geomorphic setting: Flats on flood plains
Slope range: 0 to 3 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Thin mantle of loamy alluvium over sandy alluvium
Lowest frequency of flooding (if it occurs): Very rare (January, February, August, December)
Highest frequency of flooding: Frequent (March, April, May, June)
Shallowest depth to wet zone: 1.5 feet (April, May)
Deepest depth to wet zone: 3.0 feet (July, August)
Ponding: None
Available water capacity to a depth of 60 inches: 4.8 inches
Content of organic matter in the upper 10 inches: 2.1 percent
Typical profile:
A—0 to 4 inches; fine sandy loam
Bw—4 to 31 inches; loamy fine sand
C—31 to 60 inches; stratified gravelly coarse sand to loamy fine sand

Kalmarville and similar soils
Extent: 25 to 35 percent of the unit
Geomorphic setting: Drainageways and depressions on flood plains
Slope range: 0 to 1 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Silty and loamy alluvium over sandy alluvium
Lowest frequency of flooding (if it occurs): Very rare (January, February, August, December)
Highest frequency of flooding: Frequent (March, April, May, June)
Shallowest depth to wet zone: At the surface (January, February, March, April, May, June, October, November, December)
Deepest depth to wet zone: 1.5 feet (August)
Shallowest ponding: 0.3 foot (January, February, June, July, August, September, October, December)
Deepest ponding: 0.5 foot (March, April, May, November)
Available water capacity to a depth of 60 inches: 8.4 inches
Content of organic matter in the upper 10 inches: 4.2 percent
Typical profile:
A1—0 to 6 inches; silt loam
A2—6 to 37 inches; stratified sandy loam to silt loam
Cg—37 to 42 inches; stratified sandy loam to silt loam
2Cg—42 to 60 inches; stratified coarse sand to fine sand

Minor Dissimilar Components

Scotah and similar soils
Extent: 1 to 10 percent of the unit

Palms and similar soils
Extent: 0 to 5 percent of the unit

Water
Extent: 1 to 5 percent of the unit

Riverwash
Extent: 1 to 2 percent of the unit

Markey and similar soils
Extent: 0 to 5 percent of the unit

1743F—Council-Elevasil-Norden complex, 30 to 60 percent slopes

Component Description

Council and similar soils
Extent: 30 to 40 percent of the unit
Geomorphic setting: Hills
Position on the landform: Backslopes
Slope range: 30 to 40 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy slope alluvium
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.3 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
Oe—0 to 1 inch; moderately decomposed plant material
A—1 to 3 inches; loam
Bt—3 to 45 inches; loam
C—45 to 60 inches; silt loam

Elevasil and similar soils
Extent: 25 to 35 percent of the unit
Geomorphic setting: Hills
Position on the landform: Backslopes
Slope range: 30 to 60 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Loamy slope alluvium over sandy residuum
Flooding: None
Depth to wet zone: More than 3.2 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.4 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
Oe—0 to 1 inch; moderately decomposed plant material
A—1 to 3 inches; sandy loam
Bt—3 to 27 inches; sandy loam
2BC—27 to 31 inches; loamy sand

2C—31 to 39 inches; sand
2Cr—39 to 60 inches; weathered bedrock

Norden and similar soils
Extent: 25 to 35 percent of the unit
Geomorphic setting: Hills
Position on the landform: Backslopes
Slope range: 30 to 60 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Parent material: Loess over loamy residuum
Flooding: None
Depth to wet zone: More than 3.1 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 6.9 inches
Content of organic matter in the upper 10 inches: 1.2 percent
Typical profile:
Oe—0 to 1 inch; moderately decomposed plant material
A—1 to 3 inches; silt loam
Bt—3 to 20 inches; silt loam
2Bt—20 to 37 inches; fine sandy loam
2Cr—37 to 60 inches; weathered bedrock

Minor Dissimilar Components

Seaton and similar soils
Extent: 0 to 5 percent of the unit

Rock outcrop
Extent: 0 to 2 percent of the unit

2002—Udorthents, earthen dams

Component Description

Udorthents, earthen dams, and similar soils
Extent: 100 percent of the unit
Depth to restrictive feature: Very deep (more than 60 inches)
Flooding: None
Ponding: None
General definition: Earthen dams generally consist of silty, loamy, and clayey soils. Service roads, spillways, very steep side slopes, dikes, levees, and small concrete or steel dam structures may be included.

2003A—Riverwash, nearly level

Component Description

Riverwash
Extent: 90 to 100 percent of the unit
Geomorphic setting: Flood plains
General definition: This map unit consists of unstable sediments that are reworked frequently by rivers. The sediments are typically sandy and gravelly, but in some areas they are silty or clayey. Areas along the major rivers are frequently flooded.

Minor Dissimilar Components

Kalmarville and similar soils
Extent: 0 to 5 percent of the unit

Water
Extent: 0 to 5 percent of the unit

Algansee and similar soils
Extent: 0 to 5 percent of the unit

2013—Pits, gravel

Component Description

Pits, gravel
Extent: 100 percent of the unit
General definition: This map unit consists of open excavations from which sand and/or rock fragments (mostly gravel and cobbles) have been removed. Bedrock or other material is exposed in some places. Stockpiles, service roads, and vertical side slopes may be included. Many pits have been excavated down to or below ground-water level and may have intermittent or deep water ponds.

2014—Pits, quarry, hard bedrock

Component Description

Pits, quarry, hard bedrock
Extent: 100 percent of the unit
General definition: This map unit consists of open excavations from which dolostone, quartzite, granite, or other indurated bedrock has been removed. Drilling, blasting, and crushing of material are generally required to remove and use the bedrock. Stockpiles, service roads, and vertical slopes may be included.

2030—Udorthents and Udipsamments, cut or fill

Component Description

Udorthents, cut or fill, and similar soils
Extent: 0 to 100 percent of the unit
Depth to restrictive feature: Very deep (more than 60 inches)
Flooding: None
Ponding: None
General definition: This component consists of areas where the original silty, loamy, or clayey soil profile has been altered by the addition or removal of more than about a foot of soil material. Roads, landscaped areas, and steep slopes may be included.

Udipsamments, cut or fill, and similar soils
Extent: 0 to 100 percent of the unit
Depth to restrictive feature: Very deep (more than 60 inches)
Flooding: None
Ponding: None
General definition: This component consists of areas where the original sandy soil profile has been altered by the addition or removal of more than about a foot of soil material. Roads, landscaped areas, and steep slopes may be included.

2050—Landfill

Component Description

Landfill
Extent: 100 percent of the unit
General definition: This map unit consists of areas of accumulated waste products of human habitation. The areas can be above or below natural ground level.

M-W—Miscellaneous water

Component Description

Miscellaneous water
Extent: 100 percent of the unit
General definition: This map unit consists of manmade areas that are used for industrial, sanitary, or mining applications and that contain water most of the year. Included are narrow dikes that surround the water areas.

W—Water

Component Description

Water
Extent: 100 percent of the unit
General definition: This map unit consists of rivers, streams, lakes, reservoirs, and ponds. These areas are covered with water in most years, at least during the period that is warm enough for plants to grow. Many are covered throughout the year. Small islands, flood plains, or riverwash may be included.

Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
20A	Palms and Houghton mucks, 0 to 1 percent slopes	982	0.3
21A	Palms muck, 0 to 1 percent slopes, frequently flooded	1,041	0.3
115C2	Seaton silt loam, 6 to 12 percent slopes, moderately eroded	3,780	1.0
115D2	Seaton silt loam, 12 to 20 percent slopes, moderately eroded	1,001	0.3
116C2	Churchtown silt loam, 6 to 12 percent slopes, moderately eroded	6,421	1.7
116D2	Churchtown silt loam, 12 to 20 percent slopes, moderately eroded	26,801	7.1
116E2	Churchtown silt loam, 20 to 30 percent slopes, moderately eroded	30,329	8.0
117D2	Brownchurch sandy loam, 12 to 20 percent slopes, moderately eroded	341	*
117E2	Brownchurch sandy loam, 20 to 30 percent slopes, moderately eroded	12,460	3.3
122B2	Newhouse silt loam, 2 to 6 percent slopes, moderately eroded	1,786	0.5
123C2	Blackhammer silt loam, 6 to 12 percent slopes, moderately eroded	3,219	0.9
123D2	Blackhammer silt loam, 12 to 20 percent slopes, moderately eroded	1,859	0.5
126B	Barremills silt loam, 1 to 6 percent slopes	4,305	1.1
132B2	Brinkman silt loam, 2 to 6 percent slopes, moderately eroded	1,807	0.5
132C2	Brinkman silt loam, 6 to 12 percent slopes, moderately eroded	590	0.2
133B2	Valton silt loam, 2 to 6 percent slopes, moderately eroded	4,011	1.1
133C2	Valton silt loam, 6 to 12 percent slopes, moderately eroded	21,084	5.6
133D2	Valton silt loam, 12 to 20 percent slopes, moderately eroded	7,899	2.1
134B2	Lamoille silt loam, 2 to 6 percent slopes, moderately eroded	1,122	0.3
134C2	Lamoille silt loam, 6 to 12 percent slopes, moderately eroded	7,721	2.0
137B	Mickle silt loam, 2 to 6 percent slopes	424	0.1
137C	Mickle silt loam, 6 to 12 percent slopes	179	*
144B2	NewGlarus silt loam, 2 to 6 percent slopes, moderately eroded	405	0.1
144C2	NewGlarus silt loam, 6 to 12 percent slopes, moderately eroded	8,464	2.2
144D2	NewGlarus silt loam, 12 to 20 percent slopes, moderately eroded	4,028	1.1
161B2	Fivepoints silt loam, 2 to 6 percent slopes, moderately eroded	148	*
161C2	Fivepoints silt loam, 6 to 12 percent slopes, moderately eroded	3,336	0.9
161D2	Fivepoints silt loam, 12 to 20 percent slopes, moderately eroded	40,990	10.8
163E2	Elbaville silt loam, 20 to 30 percent slopes, moderately eroded	9,246	2.4
231D	Elevasil sandy loam, 12 to 20 percent slopes, very stony	557	0.1
234C2	Basco silt loam, 6 to 12 percent slopes, moderately eroded	791	0.2
234D2	Basco silt loam, 12 to 20 percent slopes, moderately eroded	2,472	0.7
235F	Keyesville sandy loam, 20 to 65 percent slopes	1,683	0.4
253C2	Greenridge silt loam, 4 to 12 percent slopes, moderately eroded	1,272	0.3
254C2	Norden silt loam, 6 to 12 percent slopes, moderately eroded	1,055	0.3
254D2	Norden silt loam, 12 to 20 percent slopes, moderately eroded	9,960	2.6
254E2	Norden silt loam, 20 to 30 percent slopes, moderately eroded	5,988	1.6
255E2	Urne fine sandy loam, 20 to 30 percent slopes, moderately eroded	3,262	0.9
255F	Urne fine sandy loam, 30 to 45 percent slopes	2,341	0.6
264C2	Rockbridge silt loam, 6 to 12 percent slopes, moderately eroded	837	0.2
264D2	Rockbridge silt loam, 12 to 20 percent slopes, moderately eroded	632	0.2
270B2	Port byron silt loam, 2 to 6 percent slopes, moderately eroded	410	0.1
270C2	Port byron silt loam, 6 to 12 percent slopes, moderately eroded	668	0.2
284C2	Gillingham loamy fine sand, 6 to 12 percent slopes, moderately eroded	176	*
284D2	Gillingham loamy fine sand, 12 to 20 percent slopes, moderately eroded	263	*
293B2	Muscoda loamy fine sand, 1 to 6 percent slopes, moderately eroded	255	*
293C2	Muscoda loamy fine sand, 6 to 12 percent slopes, moderately eroded	62	*
293D2	Muscoda loamy fine sand, 12 to 20 percent slopes, moderately eroded	84	*
312B2	Festina silt loam, 2 to 6 percent slopes, moderately eroded	418	0.1
318A	Bearpen silt loam, 0 to 3 percent slopes, rarely flooded	3,789	1.0
326B2	Medary silt loam, 1 to 6 percent slopes, moderately eroded	154	*
336A	Toddville silt loam, 0 to 3 percent slopes	6,229	1.6
403A	Dakota silt loam, 0 to 3 percent slopes	216	*
413A	Rasset sandy loam, 0 to 3 percent slopes	2,168	0.6
424B	Merit silt loam, 1 to 6 percent slopes	400	0.1
424D2	Merit silt loam, 12 to 20 percent slopes, moderately eroded	352	*
424F	Merit silt loam, 20 to 45 percent slopes	434	0.1
433B	Forkhorn sandy loam, 2 to 6 percent slopes	200	*
434B	Bilson sandy loam, 1 to 6 percent slopes	1,159	0.3
434C2	Bilson sandy loam, 6 to 12 percent slopes, moderately eroded	258	*
435B2	Nuxmaruhanixete silt loam, 1 to 6 percent slopes, moderately eroded	726	0.2

See footnote at end of table.

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
435C2	Nuxmaruhanixete silt loam, 6 to 12 percent slopes, moderately eroded	70	*
437A	Balmoral silt loam, 0 to 3 percent slopes	116	*
446A	Merimod silt loam, 0 to 3 percent slopes	1,656	0.4
446B2	Merimod silt loam, 2 to 6 percent slopes, moderately eroded	178	*
456A	Bilmod sandy loam, 0 to 3 percent slopes	2,033	0.5
502B2	Chelsea fine sand, 2 to 6 percent slopes, moderately eroded	1,363	0.4
502C2	Chelsea fine sand, 6 to 15 percent slopes, moderately eroded	417	0.1
504A	Sparta loamy fine sand, 0 to 3 percent slopes	2,687	0.7
506A	Komro loamy sand, 0 to 3 percent slopes	395	0.1
508A	Farrington loamy sand, 0 to 3 percent slopes	82	*
511C	Plainfield sand, 6 to 15 percent slopes	212	*
511F	Plainfield sand, 15 to 60 percent slopes	176	*
568A	Majik loamy fine sand, 0 to 3 percent slopes	93	*
572B2	Windward loamy fine sand, 2 to 6 percent slopes, moderately eroded	1,248	0.3
572C2	Windward loamy fine sand, 6 to 12 percent slopes, moderately eroded	1,185	0.3
576B	Tintson sand, 1 to 6 percent slopes	285	*
601C	Beavercreek cobbly fine sandy loam, 3 to 12 percent slopes, occasionally flooded	116	*
626A	Arenzville silt loam, 0 to 3 percent slopes, occasionally flooded	8,811	2.3
628A	Orion silt loam, 0 to 3 percent slopes, occasionally flooded	14,829	3.9
629A	Ettrick silt loam, 0 to 2 percent slopes, frequently flooded	4,055	1.1
656A	Scotah loamy fine sand, 0 to 3 percent slopes, occasionally flooded	288	*
676A	Kickapoo fine sandy loam, 0 to 3 percent slopes, occasionally flooded	275	*
743C2	Council fine sandy loam, 6 to 12 percent slopes, moderately eroded	1,876	0.5
743D2	Council fine sandy loam, 12 to 20 percent slopes, moderately eroded	4,620	1.2
743E2	Council fine sandy loam, 20 to 30 percent slopes, moderately eroded	1,654	0.4
1125F	Dorerton, very stony-Elbaville complex, 30 to 60 percent slopes	48,324	12.8
1145F	Gaphill-Rockbluff complex, 30 to 60 percent slopes	9,080	2.4
1155F	Brodale-Bellechester-Rock outcrop complex, 60 to 90 percent slopes	90	*
1505C2	Sparta-Blownout land complex, 0 to 15 percent slopes	1,112	0.3
1648A	Northbend-Ettrick silt loams, 0 to 3 percent slopes, frequently flooded	7,008	1.9
1658A	Algansee-Kalmarville complex, 0 to 3 percent slopes, frequently flooded	2,776	0.7
1743F	Council-Elevasil-Norden complex, 30 to 60 percent slopes	1,862	0.5
2002	Udorthents, earthen dams	10	*
2003A	Riverwash, nearly level	14	*
2013	Pits, gravel	69	*
2014	Pits, quarry, hard bedrock	273	*
2030	Udorthents and Udipsamments, cut or fill	6	*
2050	Landfill	12	*
M-W	Miscellaneous water	19	*
W	Water	3,438	0.9
	Total	377,863	100.0

* Less than 0.1 percent.

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 forestland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; for agricultural waste management; and as 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 gravel, sand, reclamation material, 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.

Interpretive Ratings

The interpretive tables for this survey, which are accessible via the Soil Data Explorer/Soil Reports tab in Web Soil Survey (http://soils.usda.gov), rate the soils in the survey area for various uses. Many of the tables identify the limitations that affect specified uses and indicate the severity of those limitations. The ratings in these tables are both verbal and numerical.

Rating Class Terms

Rating classes are expressed in the tables in terms that indicate the extent to which the soils are limited by all of the soil features that affect a specified use or in terms that indicate the suitability of the soils for the use. Thus, the tables may show limitation classes or suitability classes. Terms for the limitation classes are *not limited, somewhat limited,* and *very limited*. The suitability ratings are expressed as *well suited, moderately suited, poorly suited,* and *unsuited* or as *good, fair,* and *poor*.

Numerical Ratings

Numerical ratings in the tables indicate the relative severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use and the point at which the soil feature is not a limitation. The limitations appear in order from the most limiting to the least limiting. Thus, if more than one limitation is identified, the most severe limitation is listed first and the least severe one is listed last.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are discussed, 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 obtaining detailed information from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Cropland Management Considerations

The main concerns in managing nonirrigated cropland are conserving moisture, controlling wind erosion and water erosion, and maintaining soil fertility.

Conserving moisture consists primarily of reducing the evaporation and runoff rates and increasing the water infiltration rate. Applying conservation tillage and conservation cropping systems, farming on the contour, stripcropping, establishing field windbreaks, and leaving crop residue on the surface conserve moisture.

Generally, a combination of several practices is needed to control *wind erosion* and *water erosion.* Conservation tillage, stripcropping, field windbreaks, contour farming, conservation cropping systems, crop residue management, terraces, diversions, and grassed waterways help to prevent excessive soil loss.

Measures that are effective in maintaining *soil fertility* include applying fertilizer, both organic and inorganic, including manure; incorporating crop residue or green manure crops into the soil; and using proper crop rotations. Controlling erosion helps to prevent the loss of organic matter and plant nutrients and thus helps to maintain productivity, although the level of fertility can be reduced even in areas where erosion is controlled. All soils used for nonirrigated crops respond well to applications of fertilizer.

Additional considerations are as follows:

Lime content, limited available water capacity, limited content of organic matter, potential poor tilth and compaction, and *restricted permeability.*—These limitations can be minimized by incorporating green manure crops, manure, or crop residue into the soil; applying a system of conservation tillage; and using conservation cropping systems. Also, crops may respond well to additions of phosphate fertilizer to soils that have a high content of lime.

Potential for ground-water contamination.—The proper use of nutrients and pesticides can reduce the risk of ground-water contamination.

Potential for surface-water contamination.—The risk of surface-water contamination can be reduced by the proper use of nutrients and pesticides and by conservation farming practices that reduce the runoff rate.

Surface crusting.—This limitation retards seedling development after periods of heavy rainfall.

Surface rock fragments.—This limitation causes rapid wear of tillage equipment. It cannot be easily overcome.

Surface stones.—Stones or boulders on or near the surface can hinder normal tillage unless they are removed.

Salt content.—In areas where this is a limitation, only salt-tolerant crops should be grown.

On irrigated soils the main management concerns are efficient water use, nutrient management, control of erosion, pest and weed control, and timely planting and harvesting for a successful crop. An irrigation system that provides optimum control and distribution of water at minimum cost is needed. Overirrigation wastes water, leaches plant nutrients, causes erosion, and increases wetness.

Yields per Acre

The tables described in this section are available through the Soil Data Explorer/Soil Reports tab in Web Soil Survey (http://soils.usda.gov). The titles are:

- “Irrigated and Nonirrigated Yields by Map Unit”
- “Irrigated and Nonirrigated Yields by Map Unit Component”
- “Irrigated Yields by Map Unit”
- “Irrigated Yields by Map Unit Component”
- “Nonirrigated Yields by Map Unit”
- “Nonirrigated Yields by Map Unit Component”

The average yields per acre shown in the yields tables for this survey are those that can be expected of the principal crops under a high level of management. In any given year, yields may be higher or lower than those indicated in the tables 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 tables.

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.

Crops other than those shown in the yields tables are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. 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 those crops.

Pasture and Hayland Interpretations

The soils in the survey area have been assigned to forage suitability groups. The soils in each group are similar enough to be suited to the same species of grasses or legumes, have similar limitations and hazards, require similar management, and have similar productivity levels and other responses to management. Detailed descriptions of forage suitability groups are available at local offices of the Natural Resources Conservation Service.

Under good management, proper grazing is essential for the production of high-quality forage, stand survival, and erosion control. Proper grazing helps plants to maintain sufficient and generally vigorous top growth during the growing season. Brush control is essential in many areas, and weed control generally is needed. Rotation grazing and pasture renovation also are important management practices.

Pasture yields are expressed in terms of animal unit months. An animal unit month (AUM) is the amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

The local office of the Natural Resources Conservation Service or the Cooperative Extension Service can provide information about forage yields other than those shown in the yields tables.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. 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 forestland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (USDA, 1961). These categories indicate the degree and kinds of limitations affecting mechanized farming systems that produce the more commonly grown field crops, such as corn, small grain, cotton, hay, and field-grown vegetables. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use.

If properly managed, soils in classes 1, 2, 3, and 4 are suitable for the mechanized production of commonly grown field crops and for pasture and forest land. The degree of the soil limitations affecting the production of cultivated crops increases progressively from class 1 to class 4. The limitations can affect levels of production and the risk of permanent soil deterioration caused by erosion and other factors.

Soils in classes 5, 6, and 7 are generally not suited to the mechanized production of commonly grown field crops without special management, but they are suitable for plants that provide a permanent cover, such as grasses and trees. The severity of the soil limitations affecting crops increases progressively from class 5 to class 7.

Areas in class 8 are generally not suitable for crops, pasture, or forest land without a level of management that is impractical. These areas may have potential for other uses, such as recreational facilities and wildlife habitat.

Capability subclasses identify the dominant kind of limitation in the class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless a 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.

There are no subclasses in class 1 because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use mainly to pasture, forest land, wildlife habitat, or recreation.

The capability classification of map units in the survey area is given in yields tables available in Web Soil Survey.

Important Farmlands

The table “Prime and Other Important Farmlands,” which is available through the Soil Data Explorer/Soil Reports tab in Web Soil Survey (http://soils.usda.gov), lists the map units in the survey area that are considered important farmlands. Important farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance. This list does not constitute a recommendation for a particular land use.

In an effort to identify the extent and location of important farmlands, the Natural Resources Conservation Service, in cooperation with other interested Federal, State, and local government organizations, has inventoried land that can be used for the production of the Nation’s food supply.

Prime farmland 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, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, 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. The water supply is dependable and of adequate quality. Prime farmland 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.

For some of the soils identified in the table as prime farmland, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures.

A recent trend in land use in some areas 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.

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, and other fruits and vegetables. It has the special combination of soil quality, growing season, moisture supply, temperature, humidity, air drainage, elevation, and aspect needed for the soil to economically produce sustainable high yields of these crops when properly managed. The water supply is dependable and of adequate quality. Nearness to markets is an additional consideration. Unique farmland is not based on national criteria. It commonly is in areas where there is a special microclimate, such as the wine country in California.

In some areas, land that does not meet the criteria for prime or unique farmland is considered to be *farmland of statewide importance* for the production of food, feed, fiber, forage, and oilseed crops. The criteria for defining and delineating farmland of statewide importance are determined by the appropriate State agencies. Generally, this land includes areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some areas may produce as high a yield as prime farmland if conditions are favorable. Farmland of statewide importance may include tracts of land that have been designated for agriculture by State law.

In some areas that are not identified as having national or statewide importance, land is considered to be *farmland of local importance* for the production of food, feed, fiber, forage, and oilseed crops. This farmland is identified by the appropriate local agencies. Farmland of local importance may include tracts of land that have been designated for agriculture by local ordinance.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Windbreaks are often planted on land that did not originally support trees. Knowledge of how trees perform on such land can be gained only by observing and recording the performance of trees that have been planted and have survived. Many popular windbreak species are not indigenous to the areas in which they are planted.

Each tree or shrub species has certain climatic and physiographic limits. Within these parameters, a tree or shrub may grow well or grow poorly, depending on the characteristics of the soil. Each tree or shrub has definable potential heights in a given physiographic area and under a given climate. Accurate definitions of potential heights are necessary when a windbreak is planned and designed.

Information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service or from a nursery.

Conservation Tree/Shrub Suitability Groups

Conservation tree/shrub suitability groups consist of soils in which the kinds and degrees of the hazards and limitations that affect the survival and growth of trees and shrubs in conservation plantings are about the same. The conservation tree/shrub suitability groups assigned to the soils in the survey area are available from the local office of the Natural Resources Conservation Service. Descriptions of the groups are provided in the "National Forestry Manual," which is available in local offices of the Natural Resources Conservation Service or on the Internet.

Forestland Management

The tables described in this section can help forest owners or managers plan the use of soils for wood crops. They rate the soils according to the limitations that affect various aspects of forestland management. The tables are accessible through the Soil Data Explorer/Soil Reports tab in Web Soil Survey (http://soils.usda.gov). The titles are:

- "Haul Roads, Log Landings, and Soil Rutting on Forestland"
- "Hazard of Erosion and Suitability for Roads on Forestland"
- "Forestland Planting and Harvesting"
- "Forestland Site Preparation"
- "Damage by Fire and Seedling Mortality on Forestland"

In these tables, interpretive ratings are given for various aspects of forestland management. The ratings are both verbal and numerical.

Some rating class terms indicate the degree to which the soils are suited to a specified aspect of forestland management. *Well suited* indicates that the soil has features that are favorable for the specified management aspect and has no limitations. Good performance can be expected, and little or no maintenance is needed. *Moderately suited* indicates that the soil has features that are moderately favorable for the specified management aspect. One or more soil properties are less than desirable, and fair performance can be expected. Some maintenance is needed. *Poorly suited* indicates that the soil has one or more properties that are unfavorable for the specified management aspect. Overcoming the unfavorable properties requires special design, extra maintenance, and costly alteration. *Unsuited* indicates that the expected performance of the soil is unacceptable for the specified management aspect or that extreme measures are needed to overcome the undesirable soil properties.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified aspect of forestland management (1.00) and the point at which the soil feature is not a limitation (0.00).

Rating class terms for fire damage and seedling mortality are expressed as *low, moderate,* and *high*. Where these terms are used, the numerical ratings indicate gradations between the point at which the potential for fire damage or seedling mortality is highest (1.00) and the point at which the potential is lowest (0.00).

The paragraphs that follow indicate the soil properties considered in rating the soils. More detailed information about the criteria used in the ratings is available in the "National Forestry Manual," which is available in local offices of the Natural Resources Conservation Service or on the Internet.

For *limitations affecting construction of haul roads and log landings*, the ratings are based on slope, flooding, permafrost, plasticity index, the hazard of soil slippage, content of sand, the Unified classification, rock fragments on or below the surface, depth to a restrictive layer that is indurated, depth to a water table, and ponding. The limitations are described as slight, moderate, or severe. A rating of *slight* indicates that no significant limitations affect construction activities, *moderate* indicates that one or more limitations can cause some difficulty in construction, and *severe* indicates that one or more limitations can make construction very difficult or very costly.

The ratings of *suitability for log landings* are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification, depth to a water table, ponding, flooding, and the hazard of soil slippage. The soils are described as well suited, moderately suited, or poorly suited to use as log landings.

Ratings in the column *soil rutting hazard* are based on depth to a water table, rock fragments on or below the surface, the Unified classification, depth to a restrictive layer, and slope. Ruts form as a result of the operation of forest equipment. The hazard is described as slight, moderate, or severe. A rating of *slight* indicates that the soil is subject to little or no rutting, *moderate* indicates that rutting is likely, and *severe* indicates that ruts form readily.

Ratings in the column *hazard of off-road or off-trail erosion* are based on slope and on soil erosion factor K. The soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 75 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance. The hazard is described as slight, moderate, severe, or very severe. A rating of *slight* indicates that erosion is unlikely under ordinary climatic conditions; *moderate* indicates that some erosion is likely and that erosion-control measures may be needed; *severe* indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and *very severe* indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.

Ratings in the column *hazard of erosion on roads and trails* are based on the soil erosion factor K, slope, and content of rock fragments. The ratings apply to unsurfaced roads and trails. The hazard is described as slight, moderate, or severe. A rating of *slight* indicates that little or no erosion is likely; *moderate* indicates that some erosion is likely, that the roads or trails may require occasional maintenance, and that simple erosion-control measures are needed; and *severe* indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed.

Ratings in the column *suitability for roads (natural surface)* are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification, depth to a water table, ponding, flooding, and the hazard of soil slippage. The ratings indicate the suitability for using the natural surface of the soil for roads. The soils are described as well suited, moderately suited, or poorly suited to this use.

Ratings in the columns *suitability for hand planting* and *suitability for mechanical planting* are based on slope, depth to a restrictive layer, content of sand, plasticity index, rock fragments on or below the surface, depth to a water table, and ponding. The soils are described as well suited, moderately suited, poorly suited, or unsuited to these methods of planting. It is assumed that necessary site preparation is completed before seedlings are planted.

Ratings in the column *suitability for use of harvesting equipment* are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification, depth to a water table, and ponding. The soils are described as well suited, moderately suited, or poorly suited to this use.

Ratings in the column *suitability for mechanical site preparation (surface)* are based on slope, depth to a restrictive layer, plasticity index, rock fragments on or below the surface, depth to a water table, and ponding. The soils are described as well suited, poorly suited, or unsuited to this management activity. The part of the soil from the surface to a depth of about 1 foot is considered in the ratings.

Ratings in the column *suitability for mechanical site preparation (deep)* are based on slope, depth to a restrictive layer, rock fragments on or below the surface, depth to a water table, and ponding. The soils are described as well suited, poorly suited, or unsuited to this management activity. The part of the soil from the surface to a depth of about 3 feet is considered in the ratings.

Ratings in the column *potential for damage to soil by fire* are based on texture of the surface layer, content of rock fragments and organic matter in the surface layer, thickness of the surface layer, and slope. The soils are described as having a low, moderate, or high potential for this kind of damage. The ratings indicate an evaluation of the potential impact of prescribed fires or wildfires that are intense enough to remove the duff layer and consume organic matter in the surface layer.

Ratings in the column *potential for seedling mortality* are based on flooding, ponding, depth to a water table, content of lime, reaction, salinity, available water capacity, soil moisture regime, soil temperature regime, aspect, and slope. The soils are described as having a low, moderate, or high potential for seedling mortality.

Forest Habitat Types

John Kotar, senior scientist, Department of Forestry, University of Wisconsin-Madison, helped prepare this section.

Modern forest management requires site classification that is based on ecological principles. It is not adequate to simply provide information on the trees that are suitable for planting on a particular soil map unit. Most trees can grow on a wide range of soils under intensive management. Intensive management is costly, however, and in the U.S. is practiced only under special conditions. Also, other natural attributes of forests, such as wildlife (including nongame species), recreation, esthetics, and biodiversity, are becoming increasingly more important.

Classifying sites or landscape units according to their biological potential helps to address these concerns. Such classification should be in terms of potential vegetation, which includes all plant species, and not only in terms of productivity of the commercially important tree species. Such a system, known as the Habitat Type Classification System, has been developed for Wisconsin's forests and is in wide use by forest managers. The forest habitat types of Richland County are derived from zones 6 and 7 of "A Guide to Forest Communities and Habitat Types of Central and Southern Wisconsin" (Kotar and Burger, 1996).

A habitat type is any land unit that is capable of supporting a particular type of climax plant community. Habitat types are identified by the presence of groups of so-called diagnostic species. The fully developed climax association need not be present for habitat type identification.

Although soil map units do not coincide exactly with habitat types, there are strong correlations between them. Therefore, habitat types can provide valuable interpretation of soil map units for forest resource management.

The field guide provides the following information: (1) Keys to habitat identification, based on presence and absence of diagnostic understory species; (2) a description of each habitat type in terms of understory species composition, prevalent forest cover types (successional stages), and expected successional trends; and (3) a summary of management implications of each habitat type. This summary, in combination with various tables and diagrams, identifies species best suited for management on a particular habitat type. This information takes into account the potential influence of competing vegetation as well as the inherent site capability. A short summary of principal ecological characteristics of selected tree species is included. The nature of forest vegetation of central and southern Wisconsin differs considerably from that in the north. In many areas, forests have been under continuous disturbance since, and even prior to, Euro-American settlement. Disturbance included fires, grazing and other uses, and logging. For these reasons the application of the classification to specific sites can be difficult, particularly the use of the identification keys in the field guide. As much floristic and descriptive information as possible was included, however, so that users should be able to interpret the major management implications of most communities and sites.

Not every community and site type is included in these classifications. The habitat types described are based on stands or woodlots that had acceptable conditions for sampling. For example, recently grazed or otherwise disturbed stands or low-density stands were not sampled. In some areas, the most productive soils are used entirely for agriculture and no forest was available for sampling. Particularly lacking were communities on the poorest sites, such as steep slopes and ridges with shallow soils, because these sites tend to be the most disturbed. Some of the habitat types that are described in this survey may not have been sampled in Richland County.

Habitat types have been determined for most of the soils in Richland County. Presently, habitat types have not been developed for the poorly drained (Npd) and very poorly drained (Nvpd) soils or the flood-plain (Nflp) soils. The vegetation on many of the very poorly drained soils, such as Markey soils, consists of grasses, sedges, and brush and only a few patches of poorly formed trees. Other areas, such as the very steep south- and west-facing “goat prairies” (Nnw), historically did not support the growth of trees, and these areas are not assigned a habitat type classification. The flood-plain soils, such as Algansee soils, commonly are forested, but sufficient information for placing them in a habitat type classification is not available at this time. Other miscellaneous areas (Nma) that are not commonly forested or for which there is not sufficient information are not assigned a habitat type classification.

A single habitat type is considered *dominant* if it constitutes more than 60 percent coverage (one habitat type that has more than 60 percent occurrence). If no habitat types are dominant but two types with 25 to 59 percent occurrence add up to more than 70 percent, then they would be considered *codominant.*

The table “Forest Habitat Types” provides a listing of the habitat types for the soil map units in the county. The following paragraphs briefly describe the habitat types that have been assigned to the soils in the county. The types are listed generally in order from the poorest and least productive to the most productive.

PVGy—Pinus strobus/Vaccinium-Gaylussacia (White pine/Blueberry-Huckleberry). Similar habitat types include PVCr and PVHa (in region 6). The landform in areas of PVGy consists of nearly level sand plains with sandstone buttes. The soils are sand or loamy sand and are typically more than 3 or 4 feet deep. They are well drained to excessively drained. Examples are Tarr and Boone soils. The moisture regime is very dry or dry. The nutrient regime is poor. This type is typically on flats and the lower slopes. On the steep upper slopes, on south-southwest aspects, and on narrow ridges, a xeric subtype is recognized. No plants consistently reflect these xeric conditions, but tree growth is strongly limited in these areas.

Common forest cover types: These include various mixtures of jack pine, red pine, white pine, pin oak, black oak, and white oak. Pines exhibit normal growth, but oaks attain only small stature and poor form. Red maple occurs mainly as saplings. In the literature, these communities are commonly referred to as pine and oak barrens.

Shrub and small tree layer: This layer is absent or poorly developed, except for huckleberry. Serviceberry, black cherry, blackberries, and raspberries are common but make up low coverage. Red maple and black cherry are commonly dominant.

Ground flora characteristics: Except for bracken fern, herbs are largely absent or are only sparsely distributed. The most common species are common milkweed, whorled loose strife, and wild lily-of-the-valley. Other species include wild sarsaparilla, false Solomon’s seal, and starflower. Because only the species that are most tolerant of drought and low-nutrient conditions occur on the most extreme end of this gradient, plants cannot be used to further distinguish between “normal” and even more xeric sites. Therefore, when vegetation keys out to PVGy on steep upper slopes, south-southwest aspects, or narrow ridges, the site must be considered as a xeric subtype of PVGy.

Disturbance and succession: All tree species occurring on this type are adapted to fire disturbance. In the absence of fire, white pine appears to be best suited for reproduction in the understory and could be expected to dominate undisturbed stands. It is not yet very abundant in present stands, but where a seed source is present it shows vigorous development in the seedling and sapling layers. White oak also appears to regenerate well enough to remain as a permanent associate. Red pine, jack pine, and black oak would become less common. Red maple and black cherry are typically well represented in the sapling layer but attain only small tree size on this type and can be expected to persist as understory associates.

PVCr—Pinus strobus/Vaccinium-Cornus racemosa (White pine/Blueberry-Gray dogwood). Similar habitat types include PVGy and PVHa (in region 6). The PVCr habitat type occurs in areas of rolling to hilly topography with sandstone outcrops. The soils are loam or silt loam. They are shallow over either deep sand or bedrock. Eleva soils are examples. The moisture regime is dry, and the nutrient regime is medium.

Common forest cover types: Mixtures of white oak, black oak, pin oak, and white pine are most common. Jack pine occurs in many stands. Red oak is generally absent. Red maple is common and grows better on this habitat type than it does on PVGy but less well than on ArDe-V. Black cherry occurs in most stands as saplings but does not develop well into larger sizes.

Shrub and small tree layer: This layer is much better represented on this type than it is on PVGy. Most diagnostic in this respect are gray dogwood and chokecherry. Black cherry also is better represented on PVCr than on other types. Other important species are blackberries, raspberries, hazel, and serviceberry.

Ground flora characteristics: The herbaceous layer is poorly developed on this type. A few species are better represented on this type than they are on PVGy and are useful for identification. These are wild sarsaparilla, true Solomon's seal, and Virginia creeper.

Disturbance and succession: All tree species occurring on this type are adapted to fire disturbance. The relative frequency and intensity of fire probably controlled community composition in presettlement time. There is no evidence to suggest that in the absence of fire the same species, with the exception of jack pine, could not maintain themselves on this type. White pine, because of its much larger stature and longer life span than that of other species, is presumed to be a potential dominant species.

PVRh—Pinus strobus/Vaccinium-Rubus hispidus (White pine/Blueberry-Dewberry). Similar habitat types include PVGy and PVHa (in region 6). The PVRh habitat type occurs in areas of nearly level sand plains with sandstone buttes. The topography and soil textures are similar to those described for PVGy, but the ground-water influence is near the surface in areas of PVRh (typically within a depth of 3 feet). Fairchild, Iron Run, and Merrillan soils are examples. In spite of the ground-water influence, the vegetation on these sandy soils is decidedly xerophytic. The moisture regime of the PVRh type is dry-mesic, and the nutrient regime is poor.

Common forest cover types: White pine, red maple, and pin oak, in various mixtures, are the most common dominant species in current stands. White oak and jack pine are common associates. Red oak generally does not occur.

Shrub and small tree layer: This layer is generally absent or is only poorly developed. Huckleberry is common, but other species have low coverage. Those with high constancy are black cherry, serviceberry, and winterberry (ilex). Winterberry is best represented on this type. Conspicuously rare are gray dogwood, chokecherry, and hazel. All of these species are typically well represented on dry and dry-mesic sites.

Ground flora characteristics: Several species with moderate individual constancy values readily distinguish this type from other types in this region. These species include partridgeberry, swamp dewberry, starflower, ground pine (Lycopodium obscurum), goldthread, bunchberry, and yellow beadlily. They are characteristic members of northern forests and are rarely found in southern habitat types. Cinnamon fern dominates the herb layer in places, especially where ground water is near the surface.

Disturbance and succession: Records of presettlement conditions show white pine as the dominant species on this habitat type. Red maple and pin oak were probably always present, but they assumed dominance after white pine was logged off. Since then, the white pine seed source has slowly increased, and white pine regeneration is now common in many stands.

ArDe-V—Acer rubrum/Desmodium (Vaccinium) (Red maple/Pointed-leaf tick trefoil-Blueberry variant). Similar habitat types include PVCr. Areas of the ArDe-V habitat type are characterized by rolling to hilly topography and sandstone or dolomitic bedrock. The soils are sandy loam or loam. Hixton loam is an example. This habitat type represents a distinct transition between dry and dry-mesic sites.

Major forest cover types: White oak and red maple are the most common dominants in stands that were sampled, but red oak occurs in some areas. Pin oak and black oak are much less common than they are on the PVCr type. White pine is common.

Shrub and small tree layer: This layer is generally well represented. The major species, in decreasing order of average coverage, are hazel, blackberries and raspberries, serviceberry, black cherry, gray dogwood, and bush honeysuckle. Red maple saplings commonly dominate this layer.

Ground flora characteristics: The number of species and the total herb coverage are higher than on other dry habitat types of this region. Blueberry occurs here with small coverage and helps to distinguish ArDe-V from ArCi and other dry-mesic and mesic types. The species that best distinguishes this type from drier types is pointed-leaf tick trefoil. Other diagnostic species with lower constancies are sweet cicely, wild geranium, and hog peanut. The best represented species are bracken fern, bigleaf aster, tick trefoil, wild sarsaparilla, and Virginia creeper.

Disturbance and succession: The pattern of presettlement fires favored the development of oak communities. Red oak is not reproducing adequately in current stands, even where it is dominant in the overstory. White oak, however, shows some ability to persist. The most successfully reproducing species is red maple. Based on understory composition and soil characteristics, it appears that sugar maple is not a potential climax dominant on this type. Red maple is the most shade-tolerant species that is well adapted to these sites and is presumed to occur as a climax species. White pine could possibly become a permanent member of communities on this type if it can be established as a seed source. The competitive relationship between white pine and red maple on this type has not been established; however, it appears that under a disturbance regime of moderate fire frequency, the two species would coexist.

ArCi-Ph—Acer rubrum/Circaea (Phryma) (Red maple/Enchanter's nightshade-Lopseed variant). Similar habitat types include ATiDe and ATiDe(Pr). The ArCi-Ph type occurs in areas of rolling to hilly sandstone terrain, particularly in areas where the soils have a thin cap of silt loam. The moisture regime is dry-mesic, and the nutrient regime is medium or rich.

Major forest cover types: Red oak, white oak, and red maple, in relatively pure stands or in mixtures, are most common. Mesic hardwoods (sugar maple, basswood, or white ash) or shagbark hickory occurs in some stands.

Shrub and small tree layer: This layer is typically well developed. The principal species, in descending order of average coverage, are blackberry/raspberry, hazel, gooseberry, gray dogwood, serviceberry, and chokecherry, but red maple and black cherry saplings commonly dominate this layer.

Ground flora characteristics: This type is distinguished from drier types of this region by the general absence of blueberry and huckleberry. Similarly, it is distinguished from the mesic types by a general lack of the blue cohosh ecological species group. The most characteristic species are nightshade, Virginia creeper, sweet cicely, wild geranium, and gooseberries.

Disturbance and succession: The climax nature of this community type has not been adequately studied. The soils do not appear to be different from those that support shade-tolerant mesic species in other parts of the region. However, these species are generally not found in this community type, and red maple is presently the most common species capable of reproducing in present oak stands. For these reasons, this type is referred to as a "community type" rather than a habitat type, and red maple can perhaps be viewed as a pseudo-climax species until a sugar maple seed source again becomes common on sites where fire once controlled community dynamics.

ATiDe and ATiDe(Pr)—Acer saccharum-Tilia/Desmodium and Acer saccharum-Tilia/Desmodium (Prunus serotina) (Sugar maple-Basswood/Tick trefoil and Sugar maple-Basswood/Tick trefoil, Black cherry phase). Similar habitat types include PVCr. The ATiDe and ATiDE(Pr) types are associated with rolling to hilly topography on valley walls. The soils are typically silt loam over cherty residuum or silt loam over sandstone. These types occur on all slope aspects but are more common on south and southwest aspects. The moisture regime is dry-mesic, and the nutrient regime is rich.

Common forest cover types: Sugar maple, basswood, and red oak are the primary dominant species on the ATiDe type. The Prunus (Pr) phase is dominated by red oak and white oak and some black oak and slippery elm. Maple and basswood are virtually absent.

Shrub and small tree layer: This layer is relatively sparse in areas of the ATiDe type. The Prunus (Pr) phase is typically dominated by gooseberry. Other common species are blackberry, black cherry, hazel, and gray dogwood.

Ground flora characteristics: The best representative species on both types include pointed-leaf tick trefoil, wild geranium, lopseed, black snakeroot, Virginia creeper, hog peanut, riverbank grape, and sweet cicely. Species that are more common on the ATiDe type than in areas of the Prunus (Pr) phase include rattlesnake fern, naked-flower tick trefoil, maidenhair fern, zig-zag goldenrod, and red baneberry. Species that are more common in areas of the Prunus (Pr) phase include agrimony, bracken fern, false Solomon's seal, and enchanter's nightshade.

Disturbance and succession: In presettlement time, most stands in areas of the ATiDe type were dominated by sugar maple-basswood. The stands of the Prunus (Pr) phase, however, developed from oak openings or communities dominated by shrubs. Although no mesic hardwoods, such as sugar maple, basswood, and white ash, occur in most current stands, the soils and understory vegetation suggest that these species are missing only as a result of the lack of a seed source. The Prunus (Pr) phase is therefore viewed only as a developmental phase and not as a different site type.

ATiCa and ATiSa—Acer-Tilia/Caulophyllum and Acer-Tilia/Sanguinaria (Sugar maple-Basswood/Blue cohosh and Sugar maple-Basswood/Bloodroot). Similar habitat types include ATiCa-Al (Baraboo section). These habitat types occur in areas of rolling to steep terrain. The soils are silt loams over cherty red clay over dolomite and sandstone. ATiCa is mainly on north and east aspects. The moisture regime in areas of this type is mesic, and the nutrient regime is very rich. The ATiSa type is typically on the south and southwest aspects and represents a transition from mesic to dry-mesic conditions.

Common forest cover types: Both types are typically dominated by sugar maple and basswood. Red oak is well represented only in the larger diameter classes (more than 10 inches in diameter at base height). Bitternut hickory and ironwood are the only other common associates. White oak is less common.

Shrub and small tree layer: The shrub layer is not well developed on either of these two types. It consists largely of saplings of canopy tree species. The only common shrubs are gooseberry, alternate-leaved dogwood, and prickly ash.

Ground flora characteristics: Understory species in areas of both types are typical of those on mesic sites in all regions, including bloodroot, large-flowered bellwort, rattlesnake fern, and maidenhair fern. Many other mesic species are distinctly more typical of the ATiCa type than of the ATiSa type. These species include blue cohosh, jack-in-the-pulpit, baneberry, trillium, sharp-lobed hepatica, and wild ginger. The ATiSa type is further distinguished from the ATiCa type by higher constancies of tick trefoil, riverbank grape, shagbark hickory, ironwood, and basswood.

Disturbance and succession: These two habitat types represent the largest block of presettlement mesic forest in southwestern Wisconsin. Dominance of sugar maple-basswood forest cannot be attributed to any particular site conditions, although the species in this type of forest are clearly best developed on north and east aspects and on deep silt loams. Many similar sites in the region support oak communities and are completely devoid of mesic hardwoods. The historic exclusion of fires is considered to be the primary cause of this vegetation pattern. Heavy cutting, grazing, and other disturbances result in an increased number of oaks and other intolerant species on many sites; however, oaks are not regenerating in these stands. Sugar maple, basswood, and especially ironwood are the most common seedlings and saplings. Bitternut hickory also occurs in many stands. White ash is much less common in this area than it is in the mesic and dry-mesic forests in the eastern part of the State.

Recreational Development

The tables described in this section are accessible through the Soil Data Explorer/Soil Reports tab in Web Soil Survey (http://soils.usda.gov). The titles are:

- “Camp Areas, Picnic Areas, and Playgrounds”
- “Paths, Trails, and Golf Fairways”

In these tables, the soils of the survey area are rated according to limitations that affect their suitability for recreational development. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the recreational uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The ratings in the tables 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.

The information in these tables can be supplemented by other information in Web Soil Survey, for example, interpretations for dwellings without basements, for local roads and streets, and for septic tank absorption fields.

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 ratings are based on the soil properties that affect the ease of developing camp areas and the performance of the areas after development. Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns affecting the development of camp areas. The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, saturated hydraulic conductivity (Ksat), and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, saturated hydraulic conductivity (Ksat), and toxic substances in the soil.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The ratings are based on the soil properties that affect the ease of developing picnic areas and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, saturated hydraulic conductivity (Ksat), and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, saturated hydraulic conductivity (Ksat), and toxic substances in the soil.

Playgrounds require soils that are nearly level, are free of stones, and can withstand intensive foot traffic. The ratings are based on the soil properties that affect the ease of developing playgrounds and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of playgrounds. For good trafficability, the surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, saturated hydraulic conductivity (Ksat), and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, saturated hydraulic conductivity (Ksat), and toxic substances in the soil.

Paths and trails for hiking and horseback riding should require little or no slope modification through cutting and filling. The ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer.

Off-road motorcycle trails require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are stoniness, slope, depth to a water table, ponding, flooding, and texture of the surface layer.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer. The suitability of the soil for traps, tees, roughs, and greens is not considered in the ratings.

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

The soils in the survey area are evaluated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat. Specific information is available at the local office of the Natural Resources Conservation Service.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of grain and seed crops are corn, soybeans, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture also are considerations. Examples of grasses and legumes are bromegrass, timothy, orchardgrass, clover, alfalfa, wheatgrass, and birdsfoot trefoil.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are bluestems, indiangrass, blueberry, goldenrod, lambsquarters, dandelions, blackberry, ragweed, and nightshade.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, box elder, birch, maple, green ash, willow, and American elm. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian olive and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, cedar, and tamarack.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweeds, wild millet, rushes, sedges, bulrushes, wild rice, arrowhead, waterplantain, cattail, prairie cordgrass, bluejoint grass, asters, and beggarticks.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and saturated hydraulic conductivity (Ksat). Examples of shallow water areas are waterfowl feeding areas, wildlife watering developments, beaver ponds, and other wildlife ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include Hungarian partridge, ring-necked pheasant, bobwhite quail, sharp-tailed grouse, meadowlark, field sparrow, killdeer, cottontail rabbit, and red fox.

Habitat for woodland wildlife consists of areas of deciduous and/or coniferous plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, thrushes, woodpeckers, owls, tree squirrels, porcupine, raccoon, white-tailed deer, and black bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, bitterns, rails, kingfishers, muskrat, otter, mink, and beaver.

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. The ratings are based on observed performance of the soils and on the data in the various soil properties reports available through the Soil Data Explorer/Soil Reports tab in Web Soil Survey (http://soils.usda.gov).

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 between the surface and a depth of 5 to 7 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 described in this section. During the fieldwork for this soil survey, determinations were made about particle-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 7 feet of the surface, soil wetness, depth to a water table, ponding, 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, saturated hydraulic conductivity (Ksat), 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 facilities; plan detailed onsite investigations of soils and geology; locate potential sources of construction material; plan structures for water management; 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

The tables described in this section are accessible through the Soil Data Explorer/Soil Reports tab in Web Soil Survey (http://soils.usda.gov). The titles are:

- “Dwellings and Small Commercial Buildings”
- “Roads and Streets, Shallow Excavations, and Lawns and Landscaping”

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. The tables described in this section show the degree and kind of soil limitations that affect dwellings with and without basements, small commercial buildings, local roads and streets, shallow excavations, and lawns and landscaping.

The ratings in the tables are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

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 soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Sanitary Facilities

The tables described in this section are accessible through the Soil Data Explorer/Soil Reports tab in Web Soil Survey (http://soils.usda.gov). The titles are:

- “Sewage Disposal”
- “Landfills”

These tables show the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, sanitary landfills, and daily cover for landfill. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

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 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Saturated hydraulic conductivity (Ksat), depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

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. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, saturated hydraulic conductivity (Ksat), depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Saturated hydraulic conductivity (Ksat) is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a Ksat rate of more than 14 micrometers per second are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Ground-water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, 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. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

A *trench sanitary landfill* is an area where solid waste is placed in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil excavated at the site. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. The ratings in the table are based on the soil properties that affect the risk of pollution, the ease of excavation, trafficability, and revegetation. These properties include saturated hydraulic conductivity (Ksat), depth to bedrock or a cemented pan, depth to a water table, ponding, slope, flooding, texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, onsite investigation may be needed.

Hard, nonrippable bedrock, creviced bedrock, or highly permeable strata in or directly below the proposed trench bottom can affect the ease of excavation and the hazard of ground-water pollution. Slope affects construction of the trenches and the movement of surface water around the landfill. It also affects the construction and performance of roads in areas of the landfill.

Soil texture and consistence affect the ease with which the trench is dug and the ease with which the soil can be used as daily or final cover. They determine the workability of the soil when dry and when wet. Soils that are plastic and sticky when wet are difficult to excavate, grade, or compact and are difficult to place as a uniformly thick cover over a layer of refuse.

The soil material used as the final cover for a trench landfill should be suitable for plants. It should not have excess sodium or salts and should not be too acid. The surface layer generally has the best workability, the highest content of organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

In an *area sanitary landfill*, solid 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. A final cover of soil material at least 2 feet thick is placed over the completed landfill. The ratings in the table are based on the soil properties that affect trafficability and the risk of pollution. These properties include flooding, saturated hydraulic conductivity (Ksat), depth to a water table, ponding, slope, and depth to bedrock or a cemented pan.

Flooding is a serious problem because it can result in pollution in areas downstream from the landfill. If the downward movement of water through the soil profile is too rapid or if fractured bedrock, a fractured cemented pan, or the water table is close to the surface, the leachate can contaminate the water supply. Slope is a consideration because of the extra grading required to maintain roads in the steeper areas of the landfill. Also, leachate may flow along the surface of the soils in the steeper areas and cause difficult seepage problems.

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. The ratings in the table also apply to the final cover for a landfill. They are based on the soil properties that affect workability, the ease of digging, and the ease of moving and spreading the material over the refuse daily during wet and dry periods. These properties include soil texture, depth to a water table, ponding, rock fragments, slope, depth to bedrock or a cemented pan, reaction, and content of salts, sodium, or lime.

Loamy or silty soils that are free of large stones and excess gravel are the best cover for a landfill. Clayey soils may be sticky and difficult to spread; sandy soils are subject to wind erosion.

Slope affects the ease of excavation and of moving the cover material. Also, it can influence runoff, erosion, and reclamation of the borrow area.

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. It should not have excess sodium, salts, or lime and should not be too acid.

Construction Materials

The tables described in this section are available through the Soil Data Explorer/Soil Reports tab in Web Soil Survey (http://soils.usda.gov). The titles are:

- “Source of Sand and Gravel”
- “Source of Reclamation Material, Roadfill, and Topsoil”

Tables showing interpretations for construction materials rate the soils as potential sources of these materials. Normal compaction, minor processing, and other standard construction practices are assumed.

Gravel and *sand* 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 the table “Source of Sand and Gravel,” only the likelihood 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 Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains sand or gravel, the soil is considered a likely source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness.

The soils are rated *good, fair,* or *poor* as potential sources of sand and gravel. A rating of *good* or *fair* means that the source material is likely to be in or below the soil. The bottom layer and the thickest layer of the soils are assigned numerical ratings. These ratings indicate the likelihood that the layer is a source of sand or gravel. The number 0.00 indicates that the layer is a poor source. The number 1.00 indicates that the layer is a good source. A number between 0.00 and 1.00 indicates the degree to which the layer is a likely source.

In the report “Source of Reclamation Material, Roadfill, and Topsoil,” the rating class terms are *good, fair,* and *poor*. The features that limit the soils as sources of these materials are specified in the tables. The numerical ratings given after the specified features indicate the degree to which the features limit the soils as sources of reclamation material, roadfill, and topsoil. The lower the number, the greater the limitation.

Reclamation material is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

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 whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a 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 AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

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. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

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

The “Ponds and Embankments” table, which is available through the Soil Data Explorer/Soil Reports tab in Web Soil Survey (http://soils.usda.gov), gives information on the soil properties and site features that affect pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

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 saturated hydraulic conductivity (Ksat) 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. Embankments that have zoned construction (core and shell) are not considered. 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 5 or 6 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.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Agricultural Waste Management

The tables described in this section are available through the Soil Data Explorer/Soil Reports tab in Web Soil Survey (http://soils.usda.gov). The titles are:

- “Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge”
- “Agricultural Disposal of Wastewater by Irrigation and Overland Flow”
- “Agricultural Disposal of Wastewater by Rapid Infiltration and Slow Rate Treatment”

Soil properties are important considerations in areas where soils are used as sites for the treatment and disposal of organic waste and wastewater. Selection of soils with properties that favor waste management can help to prevent environmental damage.

Tables showing interpretations for agricultural waste management indicate the degree and kind of soil limitations affecting the treatment of agricultural waste, including municipal and food-processing wastewater and effluent from lagoons or storage ponds. Municipal wastewater is the waste stream from a municipality. It contains domestic waste and may contain industrial waste. It may have received primary or secondary treatment. It is rarely untreated sewage. Food-processing wastewater results from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In places it is high in content of sodium and chloride. In the context of these tables, the effluent in lagoons and storage ponds is from facilities used to treat or store food-processing wastewater or domestic or animal waste. Domestic and food-processing wastewater is very dilute, and the effluent from the facilities that treat or store it commonly is very low in content of carbonaceous and nitrogenous material; the content of nitrogen commonly ranges from 10 to 30 milligrams per liter. The wastewater from animal waste treatment lagoons or storage ponds, however, has much higher concentrations of these materials, mainly because the manure has not been diluted as much as the domestic waste. The content of nitrogen in this wastewater generally ranges from 50 to 2,000 milligrams per liter. When wastewater is applied, checks should be made to ensure that nitrogen, heavy metals, and salts are not added in excessive amounts.

The ratings are for waste management systems that not only dispose of and treat organic waste or wastewater but also are beneficial to crops (application of manure and food-processing waste, application of sewage sludge, and disposal of wastewater by irrigation) and for waste management systems that are designed only for the purpose of wastewater disposal and treatment (overland flow of wastewater, rapid infiltration of wastewater, and slow rate treatment of wastewater).

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Application of manure and food-processing waste not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. Manure is the excrement of livestock and poultry, and food-processing waste is damaged fruit and vegetables and the peelings, stems, leaves, pits, and soil particles removed in food preparation. The manure and food-processing waste are either solid, slurry, or liquid. Their nitrogen content varies. A high content of nitrogen limits the application rate. Toxic or otherwise dangerous wastes, such as those mixed with the lye used in food processing, are not considered in the ratings.

The ratings are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the waste is applied, and the method by which the waste is applied. The properties that affect absorption include saturated hydraulic conductivity (Ksat), depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, and available water capacity. The properties that affect plant growth and microbial activity include reaction, the sodium adsorption ratio, salinity, and bulk density. The wind erodibility group, soil erosion factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Application of sewage sludge not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. In the context of this table, sewage sludge is the residual product of the treatment of municipal sewage. The solid component consists mainly of cell mass, primarily bacteria cells that developed during secondary treatment and have incorporated soluble organics into their own bodies. The sludge has small amounts of sand, silt, and other solid debris. The content of nitrogen varies. Some sludge has constituents that are toxic to plants or hazardous to the food chain, such as heavy metals and exotic organic compounds, and should be analyzed chemically prior to use.

The content of water in the sludge ranges from about 98 percent to less than 40 percent. The sludge is considered liquid if it is more than about 90 percent water, slurry if it is about 50 to 90 percent water, and solid if it is less than about 50 percent water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the sludge is applied, and the method by which the sludge is applied. The properties that affect absorption, plant growth, and microbial activity include saturated hydraulic conductivity (Ksat), depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, available water capacity, reaction, salinity, and bulk density. The wind erodibility group, soil erosion factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of sludge. Permanently frozen soils are unsuitable for waste treatment.

Disposal of wastewater by irrigation not only disposes of municipal wastewater and wastewater from food-processing plants, lagoons, and storage ponds but also can improve crop production by increasing the amount of water available to crops. The ratings in the table are based on the soil properties that affect the design, construction, management, and performance of the irrigation system. The properties that affect design and management include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, saturated hydraulic conductivity (Ksat), slope, and flooding. The properties that affect construction include stones, cobbles, depth to bedrock or a cemented pan, depth to a water table, and ponding. The properties that affect performance include depth to bedrock or a cemented pan, bulk density, the sodium adsorption ratio, salinity, reaction, and the cation-exchange capacity, which is used to estimate the capacity of a soil to adsorb heavy metals. Permanently frozen soils are not suitable for disposal of wastewater by irrigation.

Overland flow of wastewater is a process in which wastewater is applied to the upper reaches of sloped land and allowed to flow across vegetated surfaces, sometimes called terraces, to runoff-collection ditches. The length of the run generally is 150 to 300 feet. The application rate ranges from 2.5 to 16.0 inches per week. It commonly exceeds the rate needed for irrigation of cropland. The wastewater leaves solids and nutrients on the vegetated surfaces as it flows downslope in a thin film. Most of the water reaches the collection ditch, some is lost through evapotranspiration, and a small amount may percolate to the ground water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, and the design and construction of the system. Reaction and the cation-exchange capacity affect absorption. Reaction, salinity, and the sodium adsorption ratio affect plant growth and microbial activity. Slope, saturated hydraulic conductivity (Ksat), depth to a water table, ponding, flooding, depth to bedrock or a cemented pan, stones, and cobbles affect design and construction. Permanently frozen soils are unsuitable for waste treatment.

Rapid infiltration of wastewater is a process in which wastewater applied in a level basin at a rate of 4 to 120 inches per week percolates through the soil. The wastewater may eventually reach the ground water. The application rate commonly exceeds the rate needed for irrigation of cropland. Vegetation is not a necessary part of the treatment; hence, the basins may or may not be vegetated. The thickness of the soil material needed for proper treatment of the wastewater is more than 72 inches. As a result, geologic and hydrologic investigation is needed to ensure proper design and performance and to determine the risk of ground-water pollution.

The ratings in the table are based on the soil properties that affect the risk of pollution and the design, construction, and performance of the system. Depth to a water table, ponding, flooding, and depth to bedrock or a cemented pan affect the risk of pollution and the design and construction of the system. Slope, stones, and cobbles also affect design and construction. Saturated hydraulic conductivity (Ksat) and reaction affect performance. Permanently frozen soils are unsuitable for waste treatment.

Slow rate treatment of wastewater is a process in which wastewater is applied to land at a rate normally between 0.5 inch and 4.0 inches per week. The application rate commonly exceeds the rate needed for irrigation of cropland. The applied wastewater is treated as it moves through the soil. Much of the treated water may percolate to the ground water, and some enters the atmosphere through evapotranspiration. The applied water generally is not allowed to run off the surface. Waterlogging is prevented either through control of the application rate or through the use of tile drains, or both.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, and the application of waste. The properties that affect absorption include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, saturated hydraulic conductivity (Ksat), depth to bedrock or a cemented pan, reaction, the cation-exchange capacity, and slope. Reaction, the sodium adsorption ratio, salinity, and bulk density affect plant growth and microbial activity. The wind erodibility group, soil erosion factor K, and slope are considered in estimating the likelihood of wind erosion or water erosion. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Forest Habitat Types

(See text for descriptions of the habitat types listed in this table)

Map symbol and soil name	Habitat type	Dominance	Short scientific name
20A:			
Palms	Nvpd	Dominant	N/A (very poorly drained soil)
Houghton	Nvpd	Dominant	N/A (very poorly drained soil)
21A:			
Palms	Nvpd	Dominant	N/A (very poorly drained soil)
115C2, 115D2:			
Seaton	ATiCa	Dominant	Acer-Tilia/Caulophyllum
116C2, 116D2:			
Churchtown	ATiCa	Dominant	Acer-Tilia/Caulophyllum
116E2:			
Churchtown	ATiCa	Codominant	Acer-Tilia/Caulophyllum
	ATiDe	Codominant	Acer-Tilia/Desmodium
117D2:			
Brownchurch	ATiDe	Dominant	Acer-Tilia/Desmodium
117E2:			
Brownchurch	ATiDe	Codominant	Acer-Tilia/Desmodium
	ArDe-V	Codominant	Acer rubrum/Desmodium (Vaccinium)
122B2:			
Newhouse	ATiDe	Dominant	Acer-Tilia/Desmodium
123C2, 123D2:			
Blackhammer	ATiDe	Dominant	Acer-Tilia/Desmodium
126B:			
Barremills	ATiCa	Dominant	Acer-Tilia/Caulophyllum
132B2, 132C2:			
Brinkman	ATiCa	Dominant	Acer-Tilia/Caulophyllum
133B2, 133C2, 133D2:			
Valton	ATiSa	Dominant	Acer-Tilia/Sanguinaria
134B2, 134C2:			
Lamoille	ATiDe	Dominant	Acer-Tilia/Desmodium
137B, 137C:			
Mickle	ATiCa	Dominant	Acer-Tilia/Caulophyllum
144B2, 144C2, 144D2:			
NewGlarus	ATiDe	Dominant	Acer-Tilia/Desmodium
161B2, 161C2, 161D2:			
Fivepoints	ArCi-Ph	Dominant	Acer rubrum/Circaea (Phryma)
163E2:			
Elbaville	ATiDe	Codominant	Acer-Tilia/Desmodium
	ATiCa	Codominant	Acer-Tilia/Caulophyllum
231D:			
Elevasil	PVCr	Codominant	Pinus/Vaccinium-Cornus
	ArDe-V	Codominant	Acer rubrum/Desmodium (Vaccinium)

Forest Habitat Types--Continued

Map symbol and soil name	Habitat type	Dominance	Short scientific name
234C2, 234D2:			
Basco	ATiDe	Dominant	Acer-Tilia/Desmodium
235F:			
Keyesville	ATiDe	Codominant	Acer-Tilia/Desmodium
	ArDe-V	Codominant	Acer rubrum/Desmodium (Vaccinium)
253C2:			
Greenridge	ATiCa	Dominant	Acer-Tilia/Caulophyllum
254C2, 254D2:			
Norden	ArCi-Ph	Dominant	Acer rubrum/Circaea (Phryma)
254E2:			
Norden	ArCi-Ph	Codominant	Acer rubrum/Circaea (Phryma)
	ATiDe(Pr)	Codominant	Acer-Tilia/Desmodium-Prunus
255E2, 255F:			
Urne	ArDe-V	Codominant	Acer rubrum/Desmodium (Vaccinium)
	PVCr	Codominant	Pinus/Vaccinium-Cornus
264C2, 264D2:			
Rockbridge	ATiDe	Dominant	Acer-Tilia/Desmodium
270B2, 270C2:			
Port Byron	ATiCa	Dominant	Acer-Tilia/Caulophyllum
284C2, 284D2:			
Gillingham	ArDe-V	Dominant	Acer rubrum/Desmodium (Vaccinium)
293B2, 293C2, 293D2:			
Muscoda	ArDe-V	Dominant	Acer rubrum/Desmodium (Vaccinium)
312B2:			
Festina	ATiCa	Dominant	Acer-Tilia/Caulophyllum
318A:			
Bearpen	ATiCa	Dominant	Acer-Tilia/Caulophyllum
326B2:			
Medary	ATiDe	Dominant	Acer-Tilia/Desmodium
336A:			
Toddville	ATiCa	Dominant	Acer-Tilia/Caulophyllum
403A:			
Dakota	ArCi-Ph	Dominant	Acer rubrum/Circaea (Phryma)
413A:			
Rasset	PVCr	Codominant	Pinus/Vaccinium-Cornus
	ArDe-V	Codominant	Acer rubrum/Desmodium (Vaccinium)
424B, 424D2:			
Merit	ArCi-Ph	Dominant	Acer rubrum/Circaea (Phryma)
424F:			
Merit	ArCi-Ph	Codominant	Acer rubrum/Circaea (Phryma)
	ArDe-V	Codominant	Acer rubrum/Desmodium (Vaccinium)
433B:			
Forkhorn	ArDe-V	Dominant	Acer rubrum/Desmodium (Vaccinium)

Forest Habitat Types--Continued

Map symbol and soil name	Habitat type	Dominance	Short scientific name
434B, 434C2:			
Bilson	ArDe-V	Dominant	Acer rubrum/Desmodium (Vaccinium)
446A:			
Merimod	ArCi-Ph	Dominant	Acer rubrum/Circaea (Phryma)
435B2, 435C2:			
Nuxmaruhanixete	ATiDe(Pr)	Dominant	Acer-Tilia/Desmodium-Prunus
437A:			
Balmoral	ATiDe(Pr)	Dominant	Acer-Tilia/Desmodium-Prunus
446A, 446B2:			
Merimod	ArCi-Ph	Dominant	Acer rubrum/Circaea (Phryma)
456A:			
Bilmod	ArDe-V	Dominant	Acer rubrum/Desmodium (Vaccinium)
502B2, 502C2:			
Chelsea	PVCr	Codominant	Pinus/Vaccinium-Cornus
	PVGy	Codominant	Pinus/Vaccinium-Gaylussacia
504A:			
Sparta	PVGy	Dominant	Pinus/Vaccinium-Gaylussacia
508A:			
Farrington	PVRh	Codominant	Pinus/Vaccinium-Rubus
	PVGy	Codominant	Pinus/Vaccinium-Gaylussacia
511C:			
Plainfield	PVGy	Dominant	Pinus/Vaccinium-Gaylussacia
511F:			
Plainfield	PVGy	Codominant	Pinus/Vaccinium-Gaylussacia
	PVCr	Codominant	Pinus/Vaccinium-Cornus
568A:			
Majik	PVRh	Codominant	Pinus/Vaccinium-Rubus
	PVGy	Codominant	Pinus/Vaccinium-Gaylussacia
572B2, 572C2:			
Windward	PVCr	Dominant	Pinus/Vaccinium-Cornus
576B:			
Tintson	PVCr	Codominant	Pinus/Vaccinium-Cornus
	ArDe-V	Codominant	Acer rubrum/Desmodium (Vaccinium)
601C:			
Beavercreek	ArDe-V	Codominant	Acer rubrum/Desmodium (Vaccinium)
	ATiDe	Codominant	Acer-Tilia/Desmodium
626A:			
Arenzville	Nflp	Dominant	N/A (flood-plain soil)
628A:			
Orion	Nflp	Dominant	N/A (flood-plain soil)
629A:			
Ettrick	Npd	Dominant	N/A (poorly drained soil)
656A:			
Scotah	PVGy	Dominant	Pinus/Vaccinium-Gaylussacia

Forest Habitat Types--Continued

Map symbol and soil name	Habitat type	Dominance	Short scientific name
676A:			
Kickapoo-----------------	Nflp	Dominant	N/A (flood-plain soil)
743C2, 743D2:			
Council------------------	ATiDe	Dominant	Acer-Tilia/Desmodium
743E2:			
Council------------------	ArDe-V	Codominant	Acer rubrum/Desmodium (Vaccinium)
	ATiDe	Codominant	Acer-Tilia/Desmodium
1125F:			
Dorerton-----------------	ArCi-Ph	Codominant	Acer rubrum/Circaea (Phryma)
	ATiCa	Codominant	Acer-Tilia/Caulophyllum
Elbaville----------------	ArCi-Ph	Codominant	Acer rubrum/Circaea (Phryma)
	ATiCa	Codominant	Acer-Tilia/Caulophyllum
1145F:			
Gaphill------------------	ArDe-V	Codominant	Acer rubrum/Desmodium (Vaccinium)
	PVGy	Codominant	Pinus/Vaccinium-Gaylussacia
Rockbluff----------------	ArDe-V	Codominant	Acer rubrum/Desmodium (Vaccinium)
	PVGy	Codominant	Pinus/Vaccinium-Gaylussacia
1155F:			
Brodale------------------	Nnw	Dominant	N/A (goat prairie)
Bellechester-------------	Nnw	Dominant	N/A (goat prairie)
Rock outcrop.			
1505C2:			
Sparta-------------------	PVGy	Dominant	Pinus/Vaccinium-Gaylussacia
Blownout land------------	Nma	Dominant	N/A (miscellaneous area)
1648A:			
Northbend----------------	Nflp	Dominant	N/A (flood-plain soil)
Ettrick------------------	Nflp	Dominant	N/A (flood-plain soil)
1658A:			
Algansee-----------------	Nflp	Dominant	N/A (flood-plain soil)
Kalmarville--------------	Nflp	Dominant	N/A (flood-plain soil)
1743F:			
Council------------------	ArDe-V	Codominant	Acer rubrum/Desmodium (Vaccinium)
	PVCr	Codominant	Pinus/Vaccinium-Cornus
	ArCi-Ph	Codominant	Acer rubrum/Circaea (Phryma)
Elevasil-----------------	ArDe-V	Codominant	Acer rubrum/Desmodium (Vaccinium)
	PVCr	Codominant	Pinus/Vaccinium-Cornus
	ArCi-Ph	Codominant	Acer rubrum/Circaea (Phryma)
Norden-------------------	ArDe-V	Codominant	Acer rubrum/Desmodium (Vaccinium)
	PVCr	Codominant	Pinus/Vaccinium-Cornus
	ArCi-Ph	Codominant	Acer rubrum/Circaea (Phryma)
2002:			
Udorthents, earthen dams	Nma	Dominant	N/A (miscellaneous area)

Forest Habitat Types--Continued

Map symbol and soil name	Habitat type	Dominance	Short scientific name
2003A:			
Riverwash----------------	Nfld	Dominant	N/A (flood-plain soils)
2013, 2014:			
Pits---------------------	Nma	Dominant	N/A (miscellaneous area)
2030:			
Udorthents, cut or fill--	Nma	Dominant	N/A (miscellaneous area)
Udipsamments, cut or fill	Nma	Dominant	N/A (miscellaneous area)
2050:			
Landfill-----------------	Nma	Dominant	N/A (miscellaneous area)
M-W:			
Miscellaneous water------	Nma	Dominant	N/A (miscellaneous area)
W:			
Water--------------------	Nma	Dominant	N/A (miscellaneous area)

Soil Properties

Data relating to soil properties are collected during the course of the soil survey.

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. Samples are taken from some typical profiles and tested in the laboratory to determine particle-size distribution, plasticity, and compaction characteristics.

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 are shown in tables. They include engineering properties, physical and chemical properties, and pertinent soil and water features.

Engineering Properties

The “Engineering Properties” table described in this section is available through the Soil Data Explorer/Soil Reports tab in Web Soil Survey (http://soils.usda.gov). It gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

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 15 percent or more, 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, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-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 particle-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.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 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.

Physical Soil Properties

The "Physical Soil Properties" table described in this section is available through the Soil Data Explorer/Soil Reports tab in Web Soil Survey (http://soils.usda.gov). It shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In the table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In the table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In the table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), 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 $^{1}/_{3}$- or $^{1}/_{10}$-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each 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 linear extensibility, 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. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ability of a soil to transmit water or air. The estimates in the table indicate the rate of water movement, in micrometers per second, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) 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 soil layer. The capacity varies, depending on soil properties that affect retention of water. 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.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at $^1/_3$- or $^1/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

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 by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. 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) and the Revised Universal Soil Loss Equation (RUSLE) 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 and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

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 susceptibility to wind erosion in cultivated areas. 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 described in the "National Soil Survey Handbook," which is available in local offices of the Natural Resources Conservation Service or on the Internet.

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Chemical Soil Properties

The "Chemical Soil Properties" table described in this section is available through the Soil Data Explorer/Soil Reports tab in Web Soil Survey (http://soils.usda.gov). It shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of extractable bases 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. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Effective cation-exchange capacity refers to the sum of extractable bases plus aluminum expressed in terms of milliequivalents per 100 grams of soil. It is determined for soils that have pH of less than 5.5.

Soil reaction is a measure of acidity or alkalinity. The pH of each soil 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.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced saturated hydraulic conductivity (Ksat) and aeration, and a general degradation of soil structure.

Water Features

The “Water Features” table described in this section is available through the Soil Data Explorer/Soil Reports tab in Web Soil Survey (http://soils.usda.gov). It gives estimates of various 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.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

The *months* in the table indicate the portion of the year in which the feature is most likely to be a concern.

Water table refers to a saturated zone in the soil. The table indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding 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 ponding 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 ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area 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.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

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.

Soil Features

The “Soil Features” table described in this section is available through the Soil Data Explorer/Soil Reports tab in Web Soil Survey (http://soils.usda.gov). It gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for 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, saturated hydraulic conductivity (Ksat), 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 to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes 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 or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete 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 also is expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

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Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the "National Soil Survey Handbook" (available in local offices of the Natural Resources Conservation Service or on the Internet).

Ablation till. Loose, relatively permeable earthy material deposited during the downwasting of nearly static glacial ice, either contained within or accumulated on the surface of the glacier.

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.

Alluvium. Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl. A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction toward which a slope faces. Also called slope aspect.

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 till. Compact till deposited beneath the glacial 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 (geomorphology). 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).

Beach deposits. Material, such as sand and gravel, that is generally laid down parallel to an active or relict shoreline of a postglacial or glacial lake.

Beach ridge. A low, essentially continuous mound of beach or beach-and-dune material accumulated by the action of waves and currents on the backshore of a beach, beyond the present limit of storm waves or the reach of ordinary tides, and occurring singly or as one of a series of approximately parallel deposits. The ridges are roughly parallel to the shoreline and represent successive positions of an advancing shoreline.

Bedding plane. A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology) from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

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.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed; the adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

Blowout (map symbol). A small saucer-, cup-, or trough-shaped hollow or depression formed by wind erosion on a preexisting sand deposit. The areas are typically less than 3 acres.

Board foot. A unit of measurement represented by a board 1 foot wide, 1 foot long, and 1 inch thick.

Bog. Waterlogged, spongy ground, consisting primarily of mosses, containing acidic, decaying vegetation (such as sphagnum, sedges, and heaths) that develops into peat.

Borrow pit (map symbol). An open excavation from which soil and underlying material have been removed, usually for construction purposes. The areas are typically less than 3 acres.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

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.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

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 and under similar climatic conditions but that 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.

Catsteps. See Terracettes.

Channery soil material. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

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. See Redoximorphic features.

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.

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.

Closed depression (map symbol). A shallow, saucer-shaped area that is slightly lower on the landscape than the surrounding area and is without a natural outlet for surface drainage. Typically less than 4 acres.

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.

COLE (coefficient of linear extensibility). See Linear extensibility.

Colluvium. Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.

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.

Concretions. See Redoximorphic features.

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.

Coprogenous earth (sedimentary peat). A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

Cord. A unit of measurement of stacked wood. A standard cord occupies 128 cubic feet with dimensions of 4 feet by 4 feet by 8 feet.

Corrosion (geomorphology). A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations). 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.

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.

Cropping system. Growing crops according to a planned system of rotation and management practices.

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.

Cut or fill area (map symbol). A small area where the original soil profile has been altered by the addition or removal of more than about 1 foot of soil material. The area is typically less than 3 acres.

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.

Delta. A body of alluvium having a surface that is fan shaped and nearly flat; 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.

Depression. Any relatively sunken part of the earth's surface; especially a low-lying area surrounded by higher ground. A closed depression has no natural outlet for surface drainage. An open depression has a natural outlet for surface drainage.

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.

Disintegration moraine. A drift topography characterized by chaotic mounds and pits, generally randomly oriented, developed in supraglacial drift by collapse and flow as the underlying stagnant ice melted. Slopes may be steep and unstable. Abrupt changes between materials of differing lithology are common.

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.

Drainageway. A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Drift. A general term applied to all mineral material (clay, silt, sand, gravel, and boulders) transported by a glacier and deposited directly by or from the ice or transported by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines and stratified deposits that form outwash plains, eskers, kames, varves, and glaciofluvial sediments. The term is generally applied to Pleistocene glacial deposits in areas that no longer contain glaciers.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift. It commonly has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction. The longer axis is parallel to the general direction of glacier flow. Drumlins are products of streamline (laminar) flow of glaciers, which molded the subglacial floor through a combination of erosion and deposition.

Dry spot (map symbol). A small area of moderately well drained to excessively drained soil within a poorly drained or very poorly drained area of mineral soil, or a somewhat poorly drained to excessively drained soil within a map unit consisting mainly of organic soil. Each symbol represents one area or several closely grouped areas totaling less than 4 acres.

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.

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.

End moraine. A ridgelike accumulation produced at the outer margin of an actively flowing glacier at any given time.

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 deposit. Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

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.

Erosion pavement. A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further erosion.

Erosion surface. A land surface shaped by the action of erosion, especially by running water.

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. Most commonly applied to cliffs produced by differential erosion.

Escarpment, bedrock (map symbol). A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Exposed material is hard or soft bedrock.

Escarpment, nonbedrock (map symbol). A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Exposed material is nonsoil or very shallow soil.

Esker. A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

Fan remnant. A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

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*.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An 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.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms. A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay. A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step. An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial. Of or pertaining to rivers or streams; produced by stream or river action.

Footslope. The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest habitat type. An association of dominant tree and ground flora species in a climax community.

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.

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.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are bedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

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.

Gravel pit (map symbol). An open excavation from which soil and underlying material have been removed and used, without crushing, as a source of sand or gravel. Typically less than 4 acres.

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.

Gravelly spot (map symbol). An area where the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter. The area is typically less than 3 acres.

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 small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. 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.

Gully (map symbol). A small channel with steep sides, cut by running water, through which water ordinarily runs only after a rain or after melting of snow or ice. It generally is an obstacle to wheeled vehicles and is too deep to be obliterated 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.

Hard to reclaim (in tables). Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Head slope (geomorphology). A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

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.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A generic term for an elevated area 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. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hillslope. A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

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.

L horizon.—A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.

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.

Ice-walled lake plain. A relict surface marking the floor of an extinct lake basin that was formed on solid ground and surrounded by stagnant ice in a stable or unstable superglacial environment on stagnation moraines. As the ice melted, the lake plain became perched above the adjacent landscape. The lake plain is well sorted, generally fine textured, stratified deposits.

Igneous rock. Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., 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. A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology). A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream. A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or 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. See Redoximorphic features.

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.

Island (map symbol). A small area of mineral soil within a body of water and above the normal water level. The island is a relatively permanent feature. The areas are typically less than 3 acres.

Kame. A low mound, knob, hummock, or short irregular ridge composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a supraglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.

Karst (topography). A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll. A small, low, rounded hill rising above adjacent landforms.

K_{sat}. Saturated hydraulic conductivity. (See Permeability.)

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain. A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lake terrace. A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landfill (map symbol). An area of accumulated waste products of human habitation. Can be above or below natural ground level. The area is typically less than 3 acres.

Landslide. A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. 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.

Levee (map symbol). An embankment built to confine or control water, especially one built along the banks of a river to prevent overflow onto lowlands.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^1/_3$- or $^1/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

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. Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Low strength. The soil is not strong enough to support loads.

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.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Mass movement. A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.

Masses. See Redoximorphic features.

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 at depth in the earth's crust. Nearly all such rocks are crystalline.

Mine or quarry (map symbol). An open excavation from which soil and underlying material are removed, exposing the bedrock. Also used to denote surface openings to underground mines. The areas are typically less than 3 acres.

Mine spoil. An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.

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. A kind of map unit 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.

Moraine. In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.

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).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

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.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. See Redoximorphic features.

Nose slope (geomorphology). A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

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

Outwash. Stratified and sorted sediments (chiefly sand and gravel) removed or "washed out" from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of a glacier. The coarser material is deposited nearer to the ice.

Outwash plain. An extensive lowland area of coarse textured glaciofluvial material. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

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.

Pedisediment. A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.

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.

Perennial water (map symbol). A small, natural or constructed lake, pond, or pit that contains water most of the year. The areas are typically less than 3 acres.

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:

Impermeable	less than 0.0015 inch
Very slow	0.0015 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

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitted outwash plain. An outwash plain marked by many irregular depressions, such as kettles, shallow pits, and potholes, which formed by melting of incorporated ice masses; common in Wisconsin and Minnesota.

Pitting (in tables). Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology). A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Poletimber. Hardwood trees ranging from 5 to 11 inches in diameter and conifers ranging from 5 to 9 inches in diameter at breast height.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

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.

Pore linings. See Redoximorphic features.

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.

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.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed as 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. See Redoximorphic features.

Redoximorphic depletions. See Redoximorphic features.

Redoximorphic features. Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
   A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; *and*
   B. Masses, which are noncemented concentrations of substances within the soil matrix; *and*
   C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.
2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
   A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; *and*
   B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).
3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix. See Redoximorphic features.
Regolith. All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.
Relief. The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.
Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.
Rill. A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.
Riser. The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.
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.
Rock outcrop (map symbol). An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock. The areas are typically less than 3 acres.
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.
Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.
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.
Sandy spot (map symbol). An area where the surface layer contains more than 75 percent sand and where the named soils of the surrounding map unit have less than about 25 percent sand. The area is typically less than 3 acres.
Sapling. A tree ranging from 1 to 5 inches in diameter at breast height.
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.
Saturated hydraulic conductivity (K_{sat}). See Permeability.
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.
Sawtimber. Hardwood trees more than 11 inches in diameter and conifers more than 9 inches in diameter at breast height.
Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.
Sedimentary rock. A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Seedling. A tree less than 1 inch in diameter at breast height.

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 that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short steep slope (map symbol). A narrow area of soil that is at least two slope classes steeper than the surrounding map unit. The area is typically less than 3 acres.

Shoulder. The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

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 (geomorphology). A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

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. An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

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.

Sinkhole. A closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

Sinkhole (map symbol). A closed depression formed either by solution of the surficial rock or by collapse of underlying caves. Typically less than 3 acres.

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.

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.

Slope alluvium. Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in 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 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.

Spoil area (map symbol). Piles of earthy materials, either smoothed or uneven, resulting from human activity. The areas are typically less than 3 acres.

Stone line. In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

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.

Strath terrace. A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

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.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

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.

Swale. A slight depression in the midst of generally level land. A shallow depression in an undulating ground moraine caused by uneven glacial deposition.

Terminal moraine. An end moraine that marks the farthest advance of a glacier. It typically has the form of a massive arcuate or concentric ridge, or complex of ridges, and is underlain by till and other types of drift.

Terrace (conservation). 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 (geomorphology). A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Terracettes. Small, irregular steplike forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock, such as sheep or cattle.

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.

Till. Dominantly unsorted and nonstratified drift, generally unconsolidated and deposited directly by a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders; rock fragments of various lithologies are embedded within a finer matrix that can range from clay to sandy loam.

Till plain. An extensive area of level to gently undulating soils underlain predominantly by till and bounded at the distal end by subordinate recessional or end moraines.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. 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.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread. The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Upland. An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Valley fill. The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very stony spot (map symbol). An area in which more than 3.0 percent of the surface is covered by rock fragments more than 10 inches in diameter within an area that does not have rock fragments on the surface. The area is typically less than 3 acres.

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 disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth's surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered 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.

Wet spot (map symbol). An area of somewhat poorly drained to very poorly drained soil at least two drainage classes wetter than the named soils in the surrounding map unit. The area is typically less than 3 acres.

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.

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