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Riparian and Wetland Plant Community Types of the Shoshone National Forest

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Abstract

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Key words: vegetation classification, riparian, community type, Shoshone National Forest

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INTRODUCTION

This classification of riparian and wetland plant communities in the Shoshone National Forest was a cooperative project between The Wyoming Natural Diversity Database (WYNDD) of The Nature Conservancy and the USDA Forest Service. The goal of this project is to identify groups of plant species that commonly occur together in particular environmental settings. Each such group of species, or plant community type, is identified by the structure of the vegetation and by the species contributing the most canopy cover. Hence our classification identifies physiognomic types based on the amounts of trees, tall shrubs, low shrubs, and herbaceous plants; and dominance types within each physiognomic type. We have sought to identify and name as community types those combinations of species that occur repeatedly, as shown by our stand data or by information from other studies elsewhere; we have tried to avoid naming every unique combination of species as a community type. We use the term "community type" in a broad sense to mean both seral or successional vegetation types and potential or climax vegetation types. We have sought to distinguish between plant associations, plant community types, ecological types, and habitat types, as have the authors of other studies.

This project fits into long-term activities of both the WYNDD and the Forest Service. WYNDD has been working since 1990 on developing a statewide riparian vegetation classification system. Previous projects have identified the major riparian community types of eastern Wyoming's plains and basins (Jones and Walford 1995) and the Bighorn Basin (Walford 1996). Other organizations and individuals also have completed or are working on classification projects in Wyoming: the Forest Service in western Wyoming (Youngblood *et. al.* 1985) and the Bighorn National Forest (Girard *et. al.* 1995), David Mattson (1984) on the Yellowstone Plateau, and Potkin and Munn (1989) on the western slope of the Wind River Range. It is the intent of WYNDD to eventually produce, through cooperation of state and federal agencies and private organizations, a statewide classification of riparian vegetation types by combining the results from these studies.

Data collected in this project are provided to Shoshone National Forest for incorporation in the Shoshone Ecological Survey Project, which will result in a map of ecological units (combinations of soil and vegetation) on the Forest. However, due to the scale of this ecological survey this riparian classification is utilized at a higher level of classification. In vegetation classification work, the classification is completed prior to a mapping process. The Forest has completed a photo interpretation mapping exercise that can now be attributed using mapping units developed from this classification. These polygons are embedded into the Ecological Survey GIS layer. This ecological inventory was developed for use in revision of the Forest Management Plan, thereby benefitting all resource programs on the Forest. Identification of high-quality riparian areas is important in determining special management designations and in providing baseline data for monitoring the effects of different management strategies.

This report provides descriptions of riparian plant community types identified on the Shoshone National Forest. A key to these associations has been included to allow identification of these community types in the field. Many of these types have been described in other classifications and inventories, primarily from the Rocky Mountain region. A comparison is made of the community types that we identified on the Shoshone National Forest with those vegetation and habitat types described elsewhere. This comparison allows us to include a more complete picture of each community type and its ecological attributes. We hope that the information in this report will prove useful to land managers by allowing them to identify riparian plant associations, by providing them with information that they can use in management and conservation, and by steering them to other sources for additional information.

STUDY AREA

The Shoshone National Forest, located in northwestern Wyoming, covers approximately 2.5 million acres of diverse land types which exist over a variety of granitic, sedimentary, and volcanic substrates. The Beartooth Mountains and Plateau of the northernmost end border Montana while the southern end includes the Wind River Range north of the Continental Divide. Also included are the Absaroka Mountains which cover much on the central portion of the Forest and form the western side bordering Yellowstone National Park. The Shoshone Forest is administratively divided, from north to south, into five Ranger Districts: Clarks Fork, Wapiti, Greybull, Wind

River, and Washakie. Riparian classification work was limited on the Washakie Ranger District due to lack of funds. It is anticipated by the authors that there are at least 4 to 8 types here that are new to the forest.

Within the National Ecological Hierarchy of Ecological Classification (McNab and Avers. 1994), the Shoshone National Forest is part of the Yellowstone Highlands Section (M331A), Bighorn Basin Section (342a), Wind River Mountains Section (M331J), and Central Basin and Hills Section (342F).

The Forest is further divided into the following subsections: Beartooth, North Absaroka, Bighorn Basin, Foothills, Absaroka, Southern Wind River, Upper Wind River, and Wind River. This level of classification contains repeating patterns of more specific Landtype Associations (LTA). The LTA is based on similarities and repeating patterns at the landscape level in characteristics such as geomorphic processes, geology, landforms, and climate. Using this hierarchical system aids in the interpretation of landscape attributes at different scales. This also emphasizes the connectedness of the resource base and greatly increases the effectiveness of management decisions.

METHODS

To develop a classification of riparian vegetation types on Shoshone National Forest, we collected information on species composition, soil properties, and other characteristics of the physical environmental from a variety of sites in riparian areas on the Wind River, Greybull, Wapiti, and Clarks Fork Ranger Districts on the Forest. In this project, we defined **riparian vegetation** to mean the plants growing along water courses, around lakes, and in depressions where subsurface water provides more moisture throughout the growing season than precipitation provides to the upland, or non-riparian, plants.

FIELD METHODS

During the summers of 1993, 1995, 1996, and 1997, vegetation ecologists from the WYNDD and soil scientists from the Shoshone National Forest selected 125 sites for sampling vegetation, soils, and environmental characteristics. Selections were based either on the recommendations of Forest Service personnel, who identified sites because of their good condition and representativeness of associations on the Forest; or on review of color-infrared aerial photographs that show areas of riparian and wetland vegetation. Most sites contained more than one type of riparian vegetation, and we generally collected information from one stand of each riparian vegetation type at the site. We defined a **stand** as an area of vegetation with relatively homogeneous species composition, vegetation structure, and environment, that differed in these characteristics from other areas of vegetation. A stand was sampled if it was large enough to contain a 0.1 ha (0.25 acres) sampling plot, and had not been drastically altered by the effects of human land uses. For example, stands with roads, or composed primarily of exotic plant species, were not sampled.

VEGETATION METHODS

In each stand, we collected information on plant canopy cover by life-form, canopy cover by species, height of each species, and ground cover using the methods of the General Field Data Form and the Plant Composition Form of the Shoshone National Forest SRI Vegetation Handbook (Houston 1993). This methodology consists, basically, of delineating a circular study plot with a radius of 37.25 feet and an area of 4,356 square feet (0.1 acre), recording the species present in the plot, and estimating the canopy cover of each species (by cover classes) and the height of each species in the plot. Types of ground cover are recorded to the nearest percent. At the sites along streams, we also measured the height of the stand above the bankfull stream channel. This information about the stand was augmented with notes about such topics as the sizes and arrangement of stands of different types in the riparian vegetation mosaic and the types of nearby upland vegetation.

Plants were identified to species in the field when possible. Specimens were collected throughout the study to confirm the identifications made in the field, and to identify unknown species. Scientific names are from Dorn (1992), and common names are from USDA Soil Conservation Service (1994a) and Hitchcock and Cronquist (1973).

SOIL METHODS

Soils were classified and described using Keys to Soil Taxonomy, 6th edition (USDA Soil Conservation Service 1994b). Box samples of each site were collected for verification and maintaining consistency between soil scientists.

Although vegetation is often the easiest feature to recognize in riparian ecosystems, characteristics of the soil, particularly soil moisture, ultimately influence the plant species composition. Soils of riparian ecosystems are usually more diverse than those of adjacent uplands. Textural and particle-size classes, organic matter accumulation decomposition, and water table may be strongly contrasting, often resulting from past changes in stream channel width and position. Differences are usually more gradual around lakes or pond margins. A seasonally high water table is required for soils to be considered riparian. This situation may range from a few days annually to year-round. The depth at which soils are wet may also vary depending on both free water and capillary fringe. Where soils remain saturated for extended periods of time, biological activity (nutrient cycling and oxidation-reduction rations) may be functioning in an anaerobic state. These gleyed soils, characterized by the presence of ferrous iron and neutral gray colors, often change color rapidly when exposed to oxygen. When water tables fluctuate more frequently between alternating wet-dry periods, oxidation and reduction reactions may produce mottling with high chroma. However, at high elevations these chemical reactions are slowed, because of cold temperatures, resulting in soil that do not display mottling.

Soils textural and particle-size classes are often indicative of the type and degree of fluvial activity that has taken place. Surface horizons usually grade from coarse to fine. Buried horizons that are strongly contrasting may indicate channel positions or stream flows different from current conditions. Structural development also is helpful in hypothesizing the degree of *in-situ* pedogenesis.

Organic matter accumulation and decomposition proceed rapidly near the soil surface within the riparian ecosystem. Material is produced on-site or may be transported by fluvial processes. However, under anaerobic conditions, decomposition rates are almost negligible, and thick organic matter layers may develop over time. Recent fluvial deposition usually results in soils with irregular decreases in organic matter with depth. This contrasts with most upland soils containing a regular decrease with depth.

Sampled riparian soils within the Shoshone National Forest belong to five soil "orders", based upon the presence or absence of diagnostic horizons or broad features characteristic of the formative processes. Six suborders are recognized, based on major moisture or temperature regimes for the order. Great groups also involve differences of moisture and temperature, but are based on soil properties rather than processes. Subgroups are named after characteristics that modify the previously-named features. Finally, the family taxa are used to group soils having similar physical and chemical properties that affect their responses to management.

Mollisols are the most frequently encountered soils within the riparian zones on the Shoshone National Forest. This order includes those soils having a dark brown to black surface horizon (the mollic epipedon) that is relatively thick, has a high base saturation, and usually well developed structure. The mollic epipedon is primarily the result of the underground decomposition of organic residues in the presence of bivalent cations such as calcium. These soils have formed under relatively stable conditions and have supported dense vegetation that usually includes graminoids. Sites are commonly found on alluvial terraces, broad valley bottoms, and gentle toeslopes away from the disruptive fluvial action of active streams. At the suborder level, mollisols that are usually saturated, with little or no free dissolved oxygen for prolonged periods during the growing season (a reducing regime) have an aquic moisture regime, and are classified as Aquolls. Mean soil temperatures on the Shoshone National Forest are between 0 and 8 C (32 and 47 F); therefore, our Aquolls have cryic temperature regimes and belong to the Cryaquoll great group. Subgroups on the forest are differentiated into Typic and Histic, based upon the presence or absence of an histic epipedon. Mollisols that are not saturated, have chroma more than 2, and lack distinct or prominent mottles, belong to the Boroll suborder. These soils all have a mean annual soil temperature lower than 8 C (47 F), and are thus classified as Cryoborolls. At the subgroup level, our soils belong to the Fluventic, Fluvaquentic, Typic, Aquic, and Pachic taxa, depending upon the presence or absence of mottles in the lower horizon, and thickness of the mollic horizon. These Cryoborolls often occur in the driest extremes of

the riparian zone, and may extend up and outward, supporting non-riparian vegetation.

Histosols are soils that contain surface horizon of organic material that is usually at least 40 cm (16 inches) thick. Suborders are distinguished by the degree of decomposition of organic material and the presence of sphagnum fibers. Most Histosols on the Forest are hemic, indicating that approximately one half of the material has decomposed enough that the botanic origin can not be determined; or fibric, with only partially decomposed wood and remains of herbaceous plants. Most Histosols on the Shoshone belong to the Cryofibrist suborder. These soils are usually permanently saturated with water and have developed cryic temperatures and very little free oxygen, resulting in slow decompositions. Pergelic Cryofibrists have been found in the area known as the "Peatbeds" on the Beartooth plateau. In these soils ice has been found at approximately 20 inches. Histosols are usually found on sites with permanent bogs and seeps, small drainages influenced by beaver dams, and broad valley bottoms with meandering streams.

Riparian Inceptisols on the Shoshone National Forest are soils that lack the mollic epipedon, and have high available water throughout the growing season, textures finer than loamy sand, and altered horizons that have lost bases but retained some weatherable minerals. The Aquic moisture regime and cryic temperature regime classifies these soils as Cryaquepts.

Entisols are those soils that have little or no evidence of pedogenic horizons, normally as a result of recent deposition by fluvial action. These soils on the Forest are within the Cryic temperature regime. Where slopes are less than 25 percent and organic-carbon content decreases irregularly with depth, soils are classified as Fluvents. They may be frequently flooded, or have great fluctuations in the water table. Depth of ground water and the presence of mottles of low chroma distinguish the Aquic or Typic subgroup of the Cryofluvents. Aquents are soils that are saturated for a longer period and are commonly bluish or gray mottled. Fluvents with extensive stratification can be found along the major river systems and debris flow fans in the Absaroka range. The typic subgroup of Cryaquents occur on a wide variety of sites, including broad valley bottoms that flood occasionally, gentle toeslopes and terraces in close proximity to high gradient streams, and narrow V-shaped drainages containing order 1 or 2 streams.

The level of soil classification used throughout the project has been the family. Family differentia for mineral soils are based on particle size. Organic soils within the Histisol order are differentiated by particle size and mineral soil depth.

VEGETATION CLASSIFICATION

In this classification, stands are grouped together based on similarity in structure and composition of the existing (as opposed to the putative potential) vegetation, as well as some non-vegetation attributes such as soil properties and position on the landscape. The classification is a hierarchy. On the most general level, the physiognomic types contain stands having dominant species of the same life-form: trees, shrubs, or herbaceous plants. Within each physiognomic type, stands that share the same major species (the species contributing the bulk of the canopy cover) in each vegetation layer are grouped together into the same community type.

Our community types are generally dominance types, in that they share the same dominant species (the species contributing the most canopy cover) in each layer. But in some cases, diagnostic species that indicate a particular habitat, but do not contribute the most canopy cover, are used to group stands together. We use the term "community type" in a broad sense to mean both seral or successional vegetation types and potential or climax vegetation types. We have not sought to distinguish between plant associations, plant community types, ecological types, and habitat types, as have the authors of other studies. We have, however, tried to identify the successional status of each community type based on the structure and composition of the stands and on information about similar vegetation types from other studies.

KEY TO RIPARIAN PLANT COMMUNITY TYPES

This key can be used to place a stand of riparian or wetland vegetation into one of the plant community types described in this report. If a stand keys to a series or other vegetation type, we have not yet described the plant community type to which it belongs.

The key is based on the amount of certain plant species in the stand. Classification of plant communities reveals similarities in abiotic parameters as well as biotic parameters; these ecological attributes of a community's site are included in the description but are not used in the key.

Select a stand of relatively homogeneous vegetation and environmental characteristics; that is, your stand should be relatively uniform in species composition, vegetation structure, and site characteristics. The classification is developed from these kinds of stands; ecotones are avoided and will be difficult to key out. You will need to accurately identify and estimate the canopy cover of the indicator species used in this key. You will also need to identify other species when checking the stand against the description.

Start with the key to the physiognomic types, which will lead you to the forest & woodland, shrub, or herbaceous types. The dichotomous key offers two choices at each junction. Read both choices before selecting the more appropriate of the two. Your choice will either lead you to another pair of choices, or will tell you what plant community type your stand likely belongs in, or will tell you that your stand belongs in a vegetation type that we did not sample and describe. Once you identify your stand using the key, read the description of the type in the classification. You must validate the determination you made in the key by comparing your stand's vegetation and site characteristics with those in the descriptions.

Key to Physiognomic Types

- 1. Trees (excluding seedlings and saplings) dominate the overstory with at least 15% combined canopy cover.
.....**FOREST & WOODLAND GROUP**
- 1. Trees (pole size and larger) not present or with canopy cover less than 15%.....2
 - 2. Shrubs (including tree seedlings and saplings) dominate the over story with at least 25% canopy cover.....**SHRUB GROUP**
 - 2. Shrubs (including tree seedlings and saplings) with combined canopy cover less than 25% and herbaceous species with combined canopy cover greater than 25%..... **HERBACEOUS GROUP**

RIPARIAN / WETLAND FOREST & WOODLAND PHYSIOGNOMIC TYPES

1. Deciduous trees compose the tree overstory: conifers are absent, or contribute less than 10% of the tree canopy cover..... 2
1. Conifers contribute at least 50% of the tree canopy cover 8
 2. *Populus balsamifera* is the dominant overstory tree with at least 25% canopy cover 3
 2. Not as above 5
3. *Cornus sericea* is well represented in the shrub layer with at least 25% canopy cover
..... **POPULUS BALSAMIFERA / CORNUS SERICEA C.T.**
3. Not as above 4
 4. *Symphoricarpos* species (*S. occidentalis*, *S. oreophilus*, or *S. albus*) and/or *Rosa* species (*R. sayi* or *R. woodsii*) are well represented in the shrub layer with individual or combined canopy cover of at least 15%**POPULUS BALSAMIFERA / SYMPHORICARPUS OCCIDENTALIS C.T.**
 4. Not as above.....**UNDESCRIBED POPULUS BALSAMIFERA TYPE**
5. *Populus angustifolia* is the dominant overstory tree with at least 25% canopy cover..... 6
5. Not as above:7
 6. *Betula occidentalis* is well represented in the understory tree/shrub layer with at least 15% canopy cover.....**POPULUS ANGUSTIFOLIA / BETULA OCCIDENTALIS C.T.**
 6. Not as above.....**UNDESCRIBED POPULUS ANGUSTIFOLIA TYPE**
7. *Populus tremuloides* is a major component of the tree canopy with at least 25% cover.....
..... **POPULUS TREMULOIDES TYPES, REFER TO FOREST KEY**
7. Not as above.....**UNDESCRIBED DECIDUOUS FOREST OR WOODLAND**
8. *Picea engelmannii* (or, rarely, *P. pungens*) dominate or codominate the tree canopy; *Abies lasiocarpa*, *Pinus contorta*, and *Pseudotsuga menziesii* may be present but are restricted to hummocks and other dry micro sites and contribute little cover..... 9
8. *Picea engelmannii* (or *P. pungens*) are minor species; other trees dominate the tree canopy.....14
9. *Salix boothii* dominates a tall shrub layer.....**PICEA ENGELMANNI / SALIX BOOTHII C.T.**
9. Tall shrubs may be present but do not form a distinct layer (canopy cover <10%)..... 10
 10. *Carex disperma* dominates the understory, which may contain a variety of wet-site forbs and grasses
.....**PICEA ENGELMANNII / CAREX DISPERSA H.T.**
 10. *Carex disperma* is absent or present in only small amounts 11

- 11. *Equisetum arvense* dominates the herbaceous understory, which may also contain a variety of wet-site forbs.....**PICEA ENGELMANNII / EQUISETUM ARVENSE H.T.**
- 11. *Equisetum arvense* is absent or present only in small amounts 12
 - 12. *Senecio triangularis* dominates the herbaceous understory, which may be rich in wet-site forbs and grasses..... **PICEA ENGELMANNII / SENECIO TRIANGULARIS C.T.**
 - 12. *Senecio triangularis* is absent, or is present in small amounts on wet micro sties 13
- 13. *Galium triflorum*, *Actaea rubra*, or *Maianthemum stellatum*, individually or together, contribute at least as much cover to the herbaceous understory as do other species, and often dominate.....
..... **PICEA ENGELMANNII / GALIUM TRIFLORUM H.T.**
- 13. Not as above.....**UNDESCRIBED PICEA ENGELMANNII TYPE**
- 14. *Abies lasiocarpa* dominates the tree canopy.....15
 - 14. Not as above**UNDESCRIBED CONIFEROUS FOREST & WOODLAND TYPE**
- 15. *Calamagrostis canadensis* dominates or co-dominates the herbaceous understory; shrubs may be present but are restricted to dry micro sites on hummocks or tree bases and do not form a distinct layer.....
..... **ABIES LASIOCARPA / CALAMAGROSTIS CANADENSIS H.T.**
- 15. Not as above.....**UNDESCRIBED ABIES LASIOCARPA TYPE**

WETLAND RIPARIAN SHRUB PHYSIOGNOMIC TYPE

- 1 Willows (*Salix* sp.) dominate the overstory, usually with at least 25% combined canopy cover..... 2
- 1. Shrubs other than willows dominate the overstory 35
 - 2. *Salix geeyeriana* is the dominant willow, usually with at least 15% canopy cover (*Salix boothii* may be present in equal amounts, but *Salix geeyeriana* creates the taller willow canopy).....3
 - 2. Not as above 7
- 3. *Carex rostrata* (or *C. vesicaria*) present with at least 25% cover.....
 - **SALIX GEYERIANA / CAREX ROSTRATA C.T.**
- 3. Not as above.....4
- 4. *Calamagrostis canadensis* present with at least 25% cover.....
 - **SALIX GEYERIANA / CALAMAGROSTIS CANADENSIS C.T.**
- 4. Not as above..... 5
- 5. Understory dominated by graminoids, with *Carex praticola*, *Juncus balticus*, *Poa pratensis*, and/or *Carex microptera* typically present in varying amounts.....**SALIX GEYERIANA / MESIC GRAMINOID C.T.**
- 5. Not as above..... 6
- 6. Understory dominated by forbs, with *Aster foliaceus*, *Pedicularis groenlandica*, *Fragaria virginiana*, and/or *Equisetum arvense* typically present in varying amounts.....
 - **SALIX GEYERIANA / MESIC FORB COMMUNITY TYPE**
- 6. Not as above.....**UNDESCRIBED SALIX GEYERIANA TYPE**
- 7. *Salix boothii* is the dominant willow, usually with at least 15% canopy cover; *Salix farriae* may be present in equal or slightly greater amounts, but *Salix boothii* creates the taller willow canopy..... 8
- 7. Not as above 12
- 8. *Carex rostrata* or *C. vesicaria* present with at least 25% cover.....
 - **SALIX BOOTHII / CAREX ROSTRATA C.T.**
- 8. Not as above..... 9
- 9. *Salix farriae* canopy cover equal or greater than *Salix boothii*.....
 -**SALIX BOOTHII / SALIX FARRIAE C.T.**
- 9. Not as above 10
- 10. Understory dominated by graminoids, with some combination of *Carex* species (*C. praticola*, *C. norvegica*, *C. microptera*, *C. lanuginosa*, or *C. aquatilis*), *Juncus balticus*, *Deschampsia cespitosa*, *Calamagrostis canadensis*, or *Poa pratensis* typically present in varying amounts.....
 -**SALIX BOOTHII / MESIC GRAMINOID C. T.**
- 10. Not as above 11

- 11. Understory dominated by forbs, with some combination of *Aster foliaceus*, *Fragaria virginiana*, *Maianthemum stellatum*, *Mertensia ciliata*, *Equisetum arvense*, and/or *Epilobium angustifolium* typically present in varying amounts..... **SALIX BOOTHII / MESIC FORB C. T.**
- 11. Not as above **UNDESCRIBED SALIX BOOTHII TYPE**
 - 12. *Salix candida* dominates, or co-dominates with *Salix planifolia*, and has at least 15% canopy cover... 13
 - 12. Not as above..... 14
- 13. *Carex rostrata* and/or *C. aquatilis* dominates the herbaceous layer with at least 35% combined canopy cover..... **SALIX CANDIDA / CAREX ROSTRATA C.T.**
- 13. Not as above..... **UNDESCRIBED SALIX CANDIDA TYPE**
 - 14. *Salix eastwoodiae* dominates the shrub layer or co-dominates with *Salix planifolia*..... 15
 - 14. Not as above 17
- 15. *Salix eastwoodiae* dominates the shrub layer or co-dominates with *S. planifolia* AND *Carex aquatilis* is the major graminoid in the understory..... **SALIX EASTWOODIAE / CAREX AQUATILIS C.T.**
- 15. Not as above 16
 - 16. *Salix eastwoodiae* dominates the shrub layer or co-dominates with *S. planifolia*, AND grasses or sedges other than *Carex aquatilis* (especially *Deschampsia cespitosa*, *Juncus balticus*, and *Carex praegracilis*) dominate the understory..... **SALIX EASTWOODIAE / MESIC GRAMINOID C.T.**
 - 16. *Salix eastwoodiae* dominates the shrub layer or co-dominates with *S. planifolia*, AND forbs contribute at least as much canopy cover as do graminoids, with *Caltha leptosepala*, *Trollius laxus*, *Antennaria corymbosa*, or *Senecio triangularis* contributing at least 10% canopy cover
..... **SALIX PLANIFOLIA / CALTHA LEPTOSEPALA C.T.**
- 17. *Salix planifolia* dominates the canopy with at least 25% cover 18
- 17. *Salix planifolia* is absent or contributes less canopy cover than do other willows 24
 - 18. *Carex scopulorum* contributes at least 35% canopy and usually dominates the herbaceous layer, which includes more canopy cover of graminoids than of forbs.....
.....**SALIX PLANIFOLIA / CAREX SCOPULORUM C.T.**
 - 18. Not as above 19
- 19. *Carex aquatilis* contributes at least 25% canopy cover to the herbaceous layer.....
..... **SALIX PLANIFOLIA / CAREX AQUATILIS C.T.**
- 19. Not as above 22

RIPARIAN

22. *Deschampsia cespitosa* dominates or codominates the herbaceous layer, which contains more canopy cover of graminoids than of forbs; *Carex aquatilis* and *C. scopulorum* are absent, or present in small amounts **SALIX PLANIFOLIA / DESCHAMPSIA CESPITOSA C.T.**
22. Not as above 23
23. Forbs contribute at least as much canopy cover as do graminoids, with *Caltha leptosepala*, *Trollius laxus*, *Antennaria corymbosa*, or *Senecio triangularis* contributing at least 10% canopy cover.....
..... **SALIX PLANIFOLIA / CALTHA LEPTOSEPALA C.T.**
23. Not as above **UNDESCRIBED SALIX PLANIFOLIA TYPE**
24. *Salix drummondiana* is the dominant willow, usually with at least 25% canopy cover.....
..... **SALIX DRUMMONDIANA SERIES**
24. Not as above 24
24. *Salix exigua* or *S. melanopsis* dominates the shrub layer 25
24. Not as above 26
25. *Poa pratensis* or *Agrostis stolonifera*, separately or together, dominate the understory species with at least 25% canopy cover **SALIX EXIGUA / POA PRATENSIS C.T.**
25. Not as above **UNDESCRIBED SALIX EXIGUA TYPE**
26. *Salix lasiandra* dominates the shrub layer or codominates with *S. lutea* **SALIX LASIANDRA C.T.**
26. Not as above 27
27. *Salix barclayi* is the dominant willow, usually with at least 25% canopy cover and *Salix wolfii* is present in nearly equal amounts **SALIX BARCLAYI - SALIX WOLFII TYPE**
27. *Salix barclayi* is absent or present in small amounts28
28. *Salix wolfii* is the dominant willow, usually with at least 25% canopy cover and *Salix boothii* is present in nearly equal amounts**SALIX BOOTHII - SALIX WOLFII TYPE**
28. Not as above 29
29. *Salix wolfii* is the dominant willow, usually with at least 25% canopy 30
29. Not as above **UNDESCRIBED SALIX BOOTHII - SALIX WOLFII TYPE**
30. *Carex aquatilis*, *C. rostrata*, or *C. vesicaria*, individually or in combination, contribute at least 25% canopy coverage **SALIX WOLFII / CAREX AQUATILIS C.T.**
30. Not as above 31
31. *Deschampsia cespitosa* dominates or co-dominates the herbaceous layer.....
..... **SALIX WOLFII / DESCHAMPSIA CESPITOSA C.T.**
31. Not as above 32

- 32. *Poa pratensis* dominates the herbaceous layer**SALIX WOLFII / POA PRATENSIS C.T.**
- 32. Not as above 33
 - 33. Forbs dominate the herbaceous layer, and *Aster foliaceus*, *Caltha leptosepala*, or *Lupinus polyphyllus* individually or in combination, contribute at least 25% canopy cover.....**SALIX WOLFII / MESIC FORB C.T.**
 - 33. Not as above**UNDESCRIBED SALIX WOLFII TYPE**
- 34. Seedlings of *Populus angustifolia* equally or more abundant than *Salix exigua*, *S. melanopsis*, *S. lasiandra* and/or *S. lutea* *Populus angustifolia***RECENT ALLUVIAL BAR COMMUNITY TYPE**
- 34. Not as above**UNDESCRIBED WILLOW (Salix sp.) TYPE**
 - 35. *Betula occidentalis* dominates or codominates the tall shrub layer AND *Cornus sericea* dominates or codominates a lower shrub layer **BETULA OCCIDENTALIS / CORNUS SERICEA C.T.**
 - 35. Not as above36
- 36. *Alnus incana* dominates or codominates a tall shrub layer 37
- 36. *Alnus incana* is present but does not dominate or codominate the shrub layer 39
 - 37. Grasses and sedges (typically *Calamagrostis canadensis*, *Poa pratensis*, *Deschampsia cespitosa*, and *Glyceria grandis*) contribute more canopy cover to the understory than do forbs.....**ALNUS INCANA / MESIC GRAMINOIDS C.T.**
 - 37. Not as above38
- 38. *Equisetum arvense* contributes at least 15% canopy cover, and usually dominates or codominates the herbaceous layer**ALNUS INCANA / EQUISETUM ARVENSE C.T.**
- 38. *Equisetum arvense* is absent, or is a minor species in the herbaceous layer, which consists primarily of forbs, or of sedges of wet habitats (such as *Carex aquatilis* and *C. rostrata*).....**UNDESCRIBED ALNUS INCANA TYPE**
- 39. *Potentilla fruticosa* (syn: *Pentaphylloides floribunda*) dominates the shrub layer with at least 25% canopy cover40
- 39. Not as above**UNDESCRIBED OTHER NON-WILLOW TYPE**
- 40. Moist site *Carex* sp.(*C. hoodii*, *C. haydeniana*, *C. albonigra*) and/or *Deschampsia cespitosa* common (drop *D. cespitosa* cover class one value if intensively grazed).....**POTENTILLA FRUTICOSA / DESCHAMPSIA CESPITOSA H.T.**
- 40. *D. cespitosa* and moist site *Carex* sp. scarce.....41
 - 41. *Festuca idahoensis* well represented or the dominant graminoid.....**POTENTILLA FRUTICOSA / FESTUCA IDAHOENSIS H.T.**
 - 41. *Poa pratensis* well represented and the dominant graminoid (disturbed sites).....**POTENTILLA FRUTICOSA / POA PRATENSIS C.T.**

HERBACEOUS GROUP

- 1. Sedges (*Carex* sp.) dominate or codominate the vegetation..... 2
- 1. Grasses, rushes, or forbs are more abundant than sedges 11
 - 2. *Carex rostrata*, *C. vesicaria*, or *C. atherodes*, individually or together, dominate or co-dominate with at least 45% canopy cover **CAREX ROSTRATA C.T.**
 - 2. Not as above3
- 3. *Carex aquatilis* dominates the vegetation, or codominates with other sedges or with grasses (especially *Deschampsia cespitosa*)4
- 3. Not as above8
 - 4. *Carex aquatilis* dominates or codominates, and *Carex limosa*, *C. scopulorum*, and *C. simulata* are absent or are present with less than 40% canopy cover each **CAREX AQUATILIS C.T.**
 - 4. Not as above5
- 5. *Carex scopulorum* contributes at least 40% canopy cover, or is the sedge with the greatest canopy cover **CAREX SCOPULORUM C.T.**
- 5. Not as above6
 - 6. *Carex limosa* contributes at least 40% canopy cover **CAREX LIMOSA C.T.**
 - 6. Not as above 7
- 7. *Carex simulata* contributes at least 40% canopy cover **CAREX SIMULATA C.T.**
- 7. Not as above **UNDESCRIBED SEDGE TYPE**
- 8. Grasses dominate the vegetation, contributing more canopy cover than sedges, rushes, or forbs9
- 8. Not as above..... 12
- 9. *Deschampsia cespitosa* contributes at least 25% canopy cover**DESCHAMPSIA CESPITOSA C.T.**
- 9. *Deschampsia cespitosa* contributes less than 25% canopy cover10
 - 10. *Elymus cinereus* dominates the herbaceous layer with at least 50% canopy cover.....**ELYMUS CINEREUS C.T.**
 - 10. Not as above:11
- 11. *Calamagrostis canadensis* dominates or codominates the vegetation.....**CALAMAGROSTIS CANADENSIS C.T.**
- 11. Not as above**UNDESCRIBED GRASS TYPE**

- 12. Rushes (*Juncus* sp.), bulrushes (*Scirpus*), or spikerushes (*Eleocharis* sp.) contribute more cover than do forbs..... 13
- 12. Not as above**UNDESCRIBED TYPE**
- 13. *Juncus balticus* contributes at least 30% canopy cover **JUNCUS BALTICUS C.T.**
- 13. Not as above**GRAMINOID TYPE UNDESCRIBED IN THIS CLASSIFICATION**

DECIDUOUS WOODLAND TYPES



***Populus angustifolia*/Recent Alluvial Bar Community Type
(Narrowleaf Cottonwood/Recent Alluvial Bar Community Type)**

Number of Stands Sampled = 2
(144V93N017, 144V93N009)

General Description

This community type consists of stands of *Populus angustifolia* seedlings and saplings growing on recently-deposited alluvial (usually gravel or cobble) bars. The herbaceous understory is usually sparse and typically contains a high proportion of exotic plant species adapted to disturbance.

Location and Environment

Sample plots in this type occurred within the Northern Absaroka subsection. Parent material consists of unconsolidated volcanic alluvium. We sampled two stands of this community type, both on streamside gravel and cobble bars within 2.5 ft. of the bankfull channel height.

Site Characteristics

Parent Material	Volcanic alluvium
Landform	Moderately wide valley bottoms
Plot Position	Alluvial bars
Elevation (ft.)	5,960 - 6,025
Precipitation (in.)	10-15

Vegetation Structure and Composition

One of our two stands consisted of a moderately-dense stand of cottonwood seedlings with scattered low shrubs (*Elaeagnus commutata*, *Rosa woodsii*, *Salix exigua*, *S. lutea*), and an understory of the exotic *Trifolium hybridum* with numerous other graminoids and forbs of mesic habitats. The second stand was a shrub layer of cottonwood saplings and *Salix melanopsis*, a lower shrub layer of *Rosa sayi*, and a sparse herbaceous layer with numerous species typical of mesic habitats, all in small amounts.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
TREES	25	20 - 30
Seedlings	10	0 - 20
Saplings	15	0 - 30
SHRUBS	25	20 - 30
Low	15	10 - 20
Medium	25	20 - 30
GRAMINOIDS	15	10 - 20
FORBS	20	10 - 30

RIPARIAN

Ground Cover

Percent cover of features on plot surface.

%	MEAN	RANGE
Bare Soil	12	5 - 20
Gravel (2 mm - 3 in)	20	10 - 30
Cobbles (3 - 10 in)	22	20 - 25
Stones (10 - 24 in)	3	1 - 5
Litter & Duff	23	16 - 30
Wood (> 1/4 in diam.)	8	2 - 15
Moss & Lichen	5	0 - 10
Basal Vegetation	9	8 - 10

Soils

GREAT GROUP: Typic Cryofluvent

PARTICLE SIZE CLASS: Sandy skeletal

AVERAGE COARSE FRAGMENTS: 59%

WATER TABLE AND MOTTLING DEPTH: Water table at the surface; mottling at 10 inches

ROOTING DEPTH: 4 inches of rooting zone

Succession & Management Implications

Stands of this community type are short-lived: they either are destroyed when the stream erodes away the bar on which they grow, or the trees mature and shrub and herbaceous layers develop, forming a new plant community type. According to Hansen *et al.* (1995), these stands become part of the *Populus angustifolia*/*Cornus sericea* community. The future composition of our two stands is difficult to predict due to the unpredictable nature of channel movement.

Geographic Distribution & Other Studies

Hansen *et al.* (1995) describe this community type from Montana as an early sere of the *P. angustifolia*/*Cornus sericea* association. It has not been described explicitly in other riparian studies, but vegetation very much like this must be present and included in other communities.



Figure 1 Along North Fork of the Shoshone River, Wapiti Ranger District.

***Populus angustifolia/Betula occidentalis* Community Type
(Narrowleaf cottonwood/Water birch Community Type)**

Number of Stands Sampled = 1
(144V93N023)

General Description

This community type includes stands of mature *Populus angustifolia* trees (sometimes with other trees) above a tall shrub layer with substantial amounts of *Betula occidentalis*, a moderately-dense low shrub layer of *Rosa* and *Ribes*, and a diverse herbaceous layer.

Location and Environment

The sample of this type occurred in the North Absaroka subsection sites are characterized by river flood-plains and adjacent terraces. The parent material is developed from unconsolidated volcanic alluvium. The one stand sampled was growing on a terrace ca. 3.5 ft. above the bankfull channel height at low elevation on the South Fork of the Shoshone River. The soil surface was largely covered by litter, with areas of exposed fine-textured alluvium.

Site Characteristics

Parent Material	Volcanic alluvium
Landform	Wide valley bottoms
Plot Position	Terrace
Elevation (ft.)	6,180
Precipitation (in.)	15-20

Vegetation Structure and Composition

The stand that we sampled had a taller tree overstory of *Populus angustifolia* and a lower tree layer of *Juniperus scopulorum*; an open tall shrub layer of *Betula occidentalis* with a small amount of *Salix lasiandra*; a sparse low shrub layer of *Rosa*, *Ribes*, and *Symphoricarpos occidentalis*; and a dense herbaceous layer dominated by the exotic grasses *Bromus inermis* and *Poa pratensis*, and containing many other graminoid and forb species.

Community Structure

Percent canopy cover by life form and size class.

	MEAN
	%
TREES	20
Medium	20
SHRUBS	20
Low	10
Medium	10
Tall	20
GRAMINOIDS	40
FORBS	30

RIPARIAN

Ground Cover

Percent cover of features on plot surface.

	MEAN
Bare Soil	
Litter & Duff	78
Wood (> 1/4 in diam.)	4
Moss & Lichen	10
Basal Vegetation	14

Soils

GREAT GROUPS: Typic Cryoboroll

PARTICLE SIZE CLASS: Fine loamy

AVERAGE COARSE FRAGMENTS: 0%

WATER TABLE AND MOTTLING DEPTH: Water table at 40 inches; mottling absent

ROOTING DEPTH: 14 inches of rooting zone

Succession & Management Implications

Our stand apparently represents a cottonwood woodland that will eventually be replaced by a juniper / woodland, as described by Hansen *et al.* (1995) for *Populus angustifolia* woodlands in Montana. The cottonwoods are not reproducing and, as the overstory trees die, the *Juniperus scopulorum* and possibly Douglas Fir and Limber Pine in the low tree layer will become the overstory trees.

Geographic Distribution & Other Studies

Our stand is similar to the *Populus angustifolia/Betula occidentalis* community type described by Padgett *et al.* (1989) from Utah, and the *P. angustifolia/B. occidentalis* plant association and the *P. angustifolia/Cornus sericea* plant association, *Betula occidentalis* phase in central Colorado (Kittel *et al.* 1994, Kittel *et al.* 1996). Hansen *et al.* (1995) describe a *Populus angustifolia/Cornus sericea* community type from Montana, the stands of which may contain substantial amounts of *Betula occidentalis*. Padgett *et al.* (1989) also describe a *P. angustifolia/C. sericea* community from Utah, but they felt that the vegetation structure in stands with a *B. occidentalis* layer is so different from stands without this tall shrub that they placed stands with *B. occidentalis* into a separate community.



Figure 2 South Fork Shoshone River below Valley School House, Wapiti Ranger District.

***Populus balsamifera*/*Cornus sericea* Community Type
(Balsam poplar/Red-osier dogwood Community Type)**

Number of Stands Sampled = 1
(144V93N011)

General Description

The *Populus balsamifera*/*Cornus sericea* type includes stands of mature balsam poplars with a dense medium-height shrub layer of *Cornus sericea*, *Salix* sp., *Rosa*, and *Ribes*, and a herbaceous layer containing a mixture of grasses and forbs typical of mesic habitats.

Location and Environment

The sample plot occurred within the Northern Absaroka subsection. The parent material is composed of unconsolidated volcanic alluvium. We sampled one stand of this community type growing on a bar with a sandy surface horizon less than 2 ft. above the height of the bankfull channel. This stand was on the North Fork of the Shoshone River at low elevation.

Site Characteristics

Parent Material Volcanic alluvium
Landform Wide valley bottom
Plot Position Stream bar
Elevation (ft.) 5,940
Precipitation (in.) 10-15

Vegetation Structure and Composition

In our stand, *Populus balsamifera* forms a tall tree overstory that contains a small amount of *Pseudotsuga menziesii*. *Alnus incana* and *Juniperus scopulorum* form a sparse shrub layer 15 ft. to 20 ft. tall, and *Salix* sp. form an intermediate shrub layer ca. 10 ft. tall. *Rosa woodsii* and several other shrubs form a low shrub layer, and the herbaceous understory is made up of *Calamagrostis canadensis*, the exotic *Bromus inermis*, and other species of grasses and forbs of mesic habitats.

Community Structure

Percent canopy cover by life form and size class.

	MEAN
	%
TREES	40
Saplings	10
Pole	20
Medium	20
Large	30
SHRUBS	50
Low	20
Medium	40
Tall	20
GRAMINOIDS	40
FORBS	30

RIPARIAN

Ground Cover

Percent cover of features on plot surface.

	MEAN
Litter & Duff	84
Wood (> 1/4 in diam.)	1
Moss & Lichen	1
Basal Vegetation	10

Soils

GREAT GROUP: Fluventic Cryoboroll

PARTICLE SIZE CLASS: Coarse loamy

AVERAGE COARSE FRAGMENTS: 0%

WATER TABLE AND MOTTLING DEPTH: Water table at 40 inches; mottling occurring at 32 inches

ROOTING DEPTH: 14 inches of rooting zone

Succession & Management Implications

The balsam poplar in our stand are not reproducing, and the stand apparently will become a shrub stand with a sparse Douglas fir overstory if the site is not disturbed. Like other cottonwoods, *Populus balsamifera* is a short-lived tree, and stands that it dominates are seral to other vegetation types.

Geographic Distribution & Other Studies

Kettler and McMullen (1996) described a *Populus balsamifera* deciduous forest series on the Routt National Forest in north-central Colorado. No other *P. balsamifera* types have been described in the region, and stands dominated by this species may be included in *Populus angustifolia* types. For example, if *P. angustifolia* is substituted for *P. balsamifera*, our stand keys to the *Populus angustifolia*/*Cornus sericea* community type of Hansen *et al.* (1995). It should be noted, though, that none of the descriptions of *P. angustifolia*/*C. stolonifera* types or related types are noted from the region (Padgett *et al.* 1989, Hansen *et al.* 1995, Girard *et al.* 1995, Kittel *et al.* 1993, Kittel *et al.* 1996) include *P. balsamifera*.



Figure 3 Elk Fork Campground, Wapiti Ranger District.

***Populus balsamifera/Symphoricarpos occidentalis* Community Type
(Balsam poplar/Western snowberry Community Type)**

Number of Stands Sampled = 2
(144V93N002, 144V93N007)

General Description

The stands of this community type consist of a tree overstory dominated by *Populus balsamifera*, a medium-height shrub layer, and a herbaceous understory dominated by exotic grasses and containing a variety of graminoids and forbs.

Location and Environment

Samples of this type are included within the Northern Absaroka subsection. Parent material in the area consists of unconsolidated volcanic alluvium. The two stands that we sampled occurred at low elevation along the North Fork of the Shoshone River. Both grew on stream terraces within ca. 5 ft. of the bankfull channel height. Nearby riparian vegetation on wetter sites includes *Carex rostrata* and *Juncus balticus* herbaceous types, and *Salix exigua* and *S. lasiandra* shrub stands. A stand of the *Elymus cinereus* herbaceous type occurs on a drier riparian surface near one stand.

Site Characteristics

Parent Material Volcanic alluvium
Landform Wide valley bottoms
Plot Position Floodplain
Elevation (ft.) 5,900 - 6,100
Precipitation (in.) 10-20

Vegetation Structure and Composition

Populus balsamifera formed an open tree overstory in our stands. A few tall shrubs were present in each stand. An open to dense shrub layer of *Symphoricarpos occidentalis*, *Rosa sayi*, *Elaeagnus commutata*, and *Ribes oxycanthoides* was present above a dense herbaceous layer dominated by the exotic grasses *Bromus inermis* and *Poa pratensis*. Several other graminoids and forbs of mesic habitats were present in substantial amounts in one or the other of the stands.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
TREES	30	30 - 30
Pole	10	10 - 10
Medium	20	10 - 30
Large	5	0 - 10
Very Large	10	0 - 20
SHRUBS	40	30 - 50
Low	30	20 - 40
Medium	25	20 - 30
Tall	5	0 - 10
GRAMINOIDS	40	40 - 40
FORBS	30	30 - 30

Ground Cover

Percent cover of features on plot surface.

	MEAN	RANGE
Bare Soil	20	5 - 35
Litter & Duff	47	45 - 50
Wood (> 1/4 in diam.)	16	2 - 30
Moss & Lichen	5	0 - 10
Basal Vegetation	15	13 - 18

Soils

GREAT GROUP: Fluventic Cryoboroll

PARTICLE SIZE CLASS: Coarse loamy

AVERAGE COARSE FRAGMENTS: 10 %

WATER TABLE AND MOTTLING DEPTH: Water table at 30 inches; mottling occurring at 30 inches

ROOTING DEPTH: 24 inches of rooting zone

Succession & Management Implications

Like other cottonwoods, *Populus balsamifera* is a short-lived tree, and both of our stands (which lack more than a trace of other trees in the overstory) apparently will become shrub stands as the cottonwoods die. The dominance of *Symphoricarpos* in the shrub layer and exotic grasses in the herbaceous layer may indicate a history of moderately heavy grazing, as suggested by Hansen *et al.* (1995) for *Populus angustifolia* stands.

Geographic Distribution & Other Studies

Only Kettler and McMullen (1996) have described a *Populus balsamifera* series from the region. Stands dominated by this species may be included in *Populus angustifolia* types. For example, if *P. angustifolia* is substituted for *P. balsamifera*, our stand keys to the *Populus angustifolia/Symphoricarpos occidentalis* community type of Hansen *et al.* (1995). It should be noted, though, that none of the descriptions of *P. angustifolia/S. occidentalis* types or related types from the region (Padgett *et al.* 1989, Hansen *et al.* 1995, Girard *et al.* 1995, Kittel *et al.* 1993, Kittel *et al.* 1996) include *P. balsamifera*.



Figure 4 Vicinity of Wapiti Ranger Station

CONIFEROUS FOREST RIPARIAN TYPES

Forest Riparian Communities

Coniferous riparian communities were not emphasized in this study. Descriptions by Steele *et al.* 1983 have been copied for use in this report. Further work is needed to refine this classification on the Shoshone National Forest. Soils usually have high water tables and include Cryaquolls, Cryofluvents, Fluventic Cryoborolls, and Cryaquepts. A concern in these types is windthrow when adjacent communities have been disturbed. These types are noted for their extremely high value for wildlife, especially grizzly bear on the Shoshone National Forest.

***Picea engelmannii*/*Salix boothii* Community Type
(Engelmann spruce/Booth willow Community Type)**

Number of Stands Sampled = 2
(145V95N041, 142V95N005)

General Description

This is a coniferous woodland type with a dense tall shrub layer and a dense, species-rich herbaceous understory.

Location and Environment

Plots of this type were sampled in both the Upper Wind River and Absaroka subsections. Parent material is derived primarily precambrian igneous and metamorphic rocks, and unconsolidated volcanic alluvium. We sampled two stands of this community type, one on a terrace ca. 2 ft. above the bankfull channel height and the other on a terrace ca. 4 ft. above the channel. Other riparian vegetation at the sites included *Salix wolfii*/*Deschampsia cespitosa* stands, *Salix geeyeriana*/*Carex rostrata* stands, small *Populus angustifolia* stands, and small *Populus tremuloides* stands. The nearby upland vegetation is spruce forest, lodgepole pine forest, and big sagebrush shrubland.

Site Characteristics

Parent Material	Volcanics, granite alluvium
Landform	Moderate and wide valley bottoms
Plot Position	Terraces
Elevation (ft.)	7,390 - 9,060
Precipitation (in.)	15-30

Vegetation Structure and Composition

Picea engelmannii and *Pinus contorta* form a tree overstory above a dense shrub layer dominated or codominated by *Salix boothii*. Other common willows are *S. drummondiana*, and *S. geeyeriana*. The dense, species-rich herbaceous layer contains substantial amounts of *Bromus ciliatus*, *Calamagrostis canadensis*, *Juncus balticus*, *Phleum pratense*, *Antennaria* sp., *Aster foliaceus*, *Astragalus* sp., *Fragaria virginiana*, *Lupinus polyphyllus*, and *Taraxacum officinale*. Numerous other graminoids and forbs may be present as well.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
TREES	25	20 - 30
Seedlings	1.5	0 - 3
Saplings	3	3 - 3
Pole	20	20 - 20
Medium	5	0.5 - 10
SHRUBS	65	60 - 70
Low	20	20 - 20
Medium	35	10 - 60
Tall	15	0 - 30
GRAMINOIDS	50	40 - 60
FORBS	60	40 - 80

Ground Cover

Percent cover of features on plot surface.

	MEAN	RANGE
Bare Soil	28	0 - 57
Gravel (2 mm - 3 in)	1.5	0 - 3
Stones (10 - 24 in)	2	0 - 4
Litter & Duff	41	25 - 58
Wood (> 1/4 in diam.)	1	0 - 2
Moss & Lichen	2	0.5 - 3
Basal Vegetation	25	9 - 42

Soils

GREAT GROUPS: Typic Cryaquepts; Typic Cryaquolls

PARTICLE SIZE CLASS: Coarse loamy

AVERAGE COARSE FRAGMENTS: 15 %

WATER TABLE AND MOTTLING DEPTH: Water table at surface to 8 inches; mottling occurring at 7 inches

ROOTING DEPTH: 15 inches of rooting zone

Succession & Management Implications

Girard *et al.* (1995) suggest that stands of this community type can be a result of disturbed examples of *Salix boothii* vegetation, in which trampling by animals has compacted the soil and lowered the water table, allowing conifers to move in.

Geographic Distribution & Other Studies

Our stands resemble the vegetation of the *Picea engelmannii/Salix boothii* community type that Girard *et al.* (1995) describe from the Bighorn National Forest. The *Picea/Calamagrostis canadensis* community type described by Hansen *et al.* (1995) in Montana would also include our stands, and one or both of them key to their *Picea/Cornus stolonifera* habitat type. Information from more stands on the Shoshone National Forest would help to establish the relationship with vegetation types described in other studies.



Figure 5 Frontier Creek, Wind River Ranger District.

***Picea engelmannii*/*Senecio triangularis* Community Type
(Engelmann spruce/Arrowleaf groundsel Community Type)**

Number of Stands Sampled = 0. This type is described from Steele *et al.* (1983), on the *Abies lasiocarpa*/*Streptopus amplexifolius* habitat type.

Location and Environment

This type can be expected around 8,000 ft. elevation as a narrow stringer along streams and seeps. These sites appear influenced by a high water table most of the year. The habitat type supporting this community type occurs in western Wyoming but is more common in Central Idaho and northeastern Utah, Steele *et al.* (1983)

Vegetation Structure and Composition

Picea usually dominates the stand as a long-lived seral species. In openings, seral undergrowths normally appear as lush tall-forb communities that usually include *Senecio triangularis*. Beneath a tree canopy, these forbs become more sparse and the shade-tolerant *Streptopus* becomes more evident. Rivulets bordered by high coverages of *Saxifraga arguta* are common.

Geographic Distribution and Other Studies

See Steele *et al.* (1983), the *Abies lasiocarpa*/*Streptopus amplexifolius* habitat type.

***Picea engelmannii*/*Carex disperma* Community Type
Engelmann spruces/softleaved sedge Community Type)**

Number of Stands Sample = 0. This type is described from Steele *et al.* (1983), on the *Picea engelmannii*/*Carex disperma* habitat type.

Location and Environment

This type occurs locally in the Beartooth, Absaroka, and Wind River Ranges, from about 7,200 ft. to 7,900 ft. elevation and usually occupies stream terraces. Soils are saturated most of the year and support an organic layer that can reach at least 12 in. thick. Roots are mostly confined to this layer, which is usually considered muck.

Vegetation Structure and Composition

Usually, *Picea engelmannii* is the dominant tree (one stand in the Wind River Range was dominated by *Picea pungens*.) Occasionally a few *Abies lasiocarpa* appear on raised micro sites. Undisturbed undergrowths, rare due to trampling by cattle, are dominated by a layer of *Carex disperma*. A diverse assemblage of wet-site forbs also occurs throughout the stand. This type is similar to the *Picea engelmannii*/*Equisetum arvense* type, and the two contain many of the same-wet herbs and shrubs.

Geographic Distribution and Other Studies

See Steele *et al.* (1983), the *Picea engelmannii*/*Carex disperma* habitat type.

***Picea engelmannii*/*Equisetum arvense* Community Type
Engelmann spruce/Common horsetail Community Type**

Number of Stands Sample = 0. This type is described from Steele *et al.* (1983), on the *Picea engelmannii*/*Equisetum arvense* habitat type.

Location and Environment

This is a minor type that can be expected at elevations of 6,200 ft. to 8,700 ft., as small patches on saturated soils of stream terraces, benches, or seeps. Soils are largely alluvial, with a mixture of parent materials, and often have a surface layer of mor humus, in some cases to 11 in. thick. This type is one of the most common coniferous riparian types on the Forest.

Vegetation Structure and Composition

Picea engelmannii is usually the dominant tree of any successional stage on these sites, but *P. pungens* may be important in low-elevation stands. *Pinus contorta* is a minor seral species, and small numbers of *Abies lasiocarpa* often appear in the stand but are usually restricted to raised micro sites. The undergrowth is dominated by *Equisetum arvense* and a rich assortment of wet site forbs, such as *Streptopus amplexifolius*, *Parnassia fimbriata*, and *Senecio triangularis*, and the graminoids *Carex* sp., *Juncus* sp., and *Luzula parviflora*. The shrub component is relatively depauperate. The sometimes extreme micro-relief generated by root crown hummocks and windthrow mounds accounts for the high species richness.

Geographic Distribution and Other Studies

See Steele *et al.* (1983), the *Picea engelmannii*/*Equisetum arvense* habitat type.

***Picea engelmannii*/*Galium triflorum* Community Type
(Engelmann spruce/Sweetscented bedstraw Community Type)**

Number of Stands Sample = 0. This type is described from Steele *et al.* (1983), on the *Picea engelmannii*/*Galium triflorum* habitat type.

Location and Environment

This apparently is an uncommon type on alluvial terraces or bottomlands between 6,100 ft. and 8,200 ft. elevation. Stands occasionally are associated with seeps. Soils are developed in alluvial deposits of various origins. Water tables are near the surface most of the year. Bare soil and rock are virtually absent but the coarse fraction content is relatively high (25%). Average litter depth can reach 4 in. Some sites have wet organic layers that can exceed 50 cm (20 in). Adjacent sites are most frequently moist habitat types of the *Abies lasiocarpa* series.

Vegetation Structure and Composition

Normally *Picea engelmannii* dominates the stand, but in scattered locations in the Wind River Range and along the Greys River in western Wyoming, *P. pungens* is sometimes dominant or codominant. Occasionally *Abies lasiocarpa* may achieve a minor foothold, and minor amounts of *Pinus contorta* and *Pseudotsuga menziesii* may invade following disturbance. Undergrowths vary considerably as a reflection of site history and adjacent plant communities. *Galium triflorum*, *Actaea rubra*, and *Maianthemum stellatum* are common throughout the type. *Streptopus amplexifolius*, *Senecio triangularis*, and *Calamagrostis canadensis* may dominate the wetter microsites.

Geographic Distribution and Other Studies

See Steele *et al.* (1983), the *Picea engelmannii*/*Galium triflorum* habitat type.

***Abies lasiocarpa/Calamagrostis canadensis* Community Type
(Subalpine fir/Bluejoint Community Type)**

Number of Stands Sample = 0. This type is described from Steele *et al.* (1983), on the *Abies lasiocarpa/Calamagrostis canadensis* habitat type.

Location and Environment

This type can be expected in the vicinity of Yellowstone National Park, on stream terraces, pond margins, and moist toeslopes from 6,800 ft. to 9,100 ft. elevation. It occupies some of the wettest sites supporting subalpine fir forests.

Vegetation Structure and Composition

Pinus contorta and *Picea engelmannii* are the major seral conifers. *Abies lasiocarpa* eventually dominates the old-growth stands. Usually *Calamagrostis canadensis* is conspicuous in the undergrowth but may codominate with different species. Shrubs characteristic of drier sites may grow on hummocks or at the bases of trees. Wet-site forbs and various *Carex* species are common in the low spots.

Geographic Distribution and Other Studies

See Steele *et al.* (1983), the *Abies lasiocarpa/Calamagrostis canadensis* habitat type.

WILLOW SHRUB TYPES

Low Willow Community Types

Low willow plant community types dominated by *Salix wolfii* were sampled between 6,870 ft. and 9,260 ft. elevation in the Clarks Fork and Wind River Ranger Districts. The stands generally occupy large areas either adjacent to small- or medium-sized channels or in swales wet from seeps or high water tables.

Plant community types dominated by *Salix eastwoodiae* occur in similar environments but generally at higher elevations. Sites supporting *Salix eastwoodiae* community types were sampled between 8,125 ft. and 9,920 ft. elevation on the Wind River and Clarks Fork Ranger Districts. The community types of *Salix wolfii* and *Salix eastwoodiae* often have a similar appearance, and the two willow species are difficult to distinguish from one another. This difficulty has led to confusion between the two species in previous studies.

Salix planifolia dominates stands of low or medium height willow community types. Two varieties are present; *Salix planifolia* var. *monica* tends to be shorter and to grow at higher elevations than *Salix planifolia* var. *planifolia*. The four community types dominated by *Salix planifolia* that we sampled on the Shoshone National Forest had an elevational range from 8,980 ft. to 9,920 ft. One high elevation community type that we sampled four times was codominated by *Salix planifolia* and *Salix eastwoodiae*. The stands are most often found in very wet swales or on hillslopes dissected with small channels from seeps.

Salix candida dominates a final low willow community sampled only once on the Shoshone National Forest in the Clarks Fork Ranger District. It occurred on an anchored floating mat near an open lake. The persistence of this community type depends on the water regime remaining stable (Chadde 1988).

Salix wolfii/*Carex aquatilis* Community Type (Wolf's willow/Water sedge Community Type)

Number of Stands Sampled = 5

(145V95N002, 145V95N015, 145V95N020, 141V93N024, 141V96N060, 141V93N026)

General Description

On the Shoshone National Forest the *Salix wolfii*/*Carex aquatilis* community type is found on saturated soils in depressions of sediment-filled lake basins or along small, meandering stream channels. The stands are dominated by a patchy canopy of low *Salix wolfii* shrubs with a dense graminoid layer (dominated by *Carex aquatilis* or *Carex rostrata*) and few forbs.

Location and Environment

Samples for this type were found in the Beartooth, Wind River and Upper Wind River subsections. Occurring on montane to subalpine lakebed and till deposits in granitic and volcanic valley bottom landscapes. Parent material is derived from primarily unconsolidated, mixed alluvium..

Stands of the *Salix wolfii*/*Carex aquatilis* community type were sampled in the Clarks Fork and Wind River Ranger Districts. Sites were located along Charlie Creek, Clint Creek, Parque Creek, near Lily Lake, and at a wetland west of Lily Lake. Our five stands of this community type were located beside narrow or medium-sized, low gradient, meandering channels or in wet basins of narrow to wide valleys. In the alluvial basin sites, small channels often run through the stand. One site is near a lake that is filling with sediment and vegetation. All our stands have saturated soils with patches of water at the surface. The micro topography is hummocky with mounds created around the low shrubs. Moss occurs on the saturated soil but not in the water.

Stands of the *Salix wolfii*/*Carex aquatilis* community type typically occur as patches within a mosaic of other riparian/wetland community types and often dominate the mosaic. Adjacent riparian/wetland community types include: *Carex rostrata* wet meadow, *Salix boothii*/*Carex rostrata* stands, *Deschampsia cespitosa* wet meadows, *Carex simulata* meadows, and *Salix boothii*-*Salix geyeriana* stands. Upland hillslopes contain *Pentaphylloides floribunda* (syn. *Potentilla fruticosa*)/*Poa pratensis* stands or conifer forests, often with *Picea engelmannii*. At one site the *Salix wolfii*/*Carex aquatilis* community type is replacing a wet *Carex rostrata* meadow, and an adjacent *Picea engelmannii* forest is slowly encroaching on the community type.

Site Characteristics

Parent Material	Volcanic, granitic alluvium
Landform	Narrow to wide valley bottoms
Plot Position	Basin, floodplain, terrace
Elevation (ft)	7,670 - 9,140
Precipitation (in.)	15-50

Vegetation Structure and Composition

Stands of the *Salix wolfii*/*Carex aquatilis* community type are dominated by moderately spaced patches of low willows, predominantly *Salix wolfii*. Other common low shrubs include *Betula glandulosa* and *Pentaphylloides floribunda* (syn. *Potentilla fruticosa*). The shrub heights range from 1 ft. to 4 ft.

The herbaceous layer is dense in the openings between the shrubs and averages 1.5 ft tall. Graminoids are dominant, particularly *Carex aquatilis* and *Carex rostrata*. Three of our five stands had more *Carex aquatilis* than *Carex rostrata*. There was also equal or slightly greater amounts of one other sedge (*Carex praegracilis*, *Carex microptera*, or *Carex haydeniana*) in these three stands. Two stands of the *Salix wolfii*/*Carex aquatilis* community type had equal or greater amounts of *Carex rostrata* dominating the herbaceous layer. Other common graminoids are *Deschampsia cespitosa*, *Juncus balticus*, and *Poa pratensis*. Forbs are less common, with *Aster foliaceus* and *Fragaria virginiana* present in moderate amounts.

RIPARIAN

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
TREES	2	0 - 10
Seedlings	2	0 - 10
Saplings	2	3-10
SHRUBS	63	40 - 80
Low	52	20 - 80
Medium	15	0 - 50
GRAMINOIDS	53	30 - 80
FORBS	18	10 - 30

Ground Cover

Percent cover of features on plot surface.

	MEAN	RANGE
	%	%
Bare Soil	15	1 - 54
Litter & Duff	24	5 - 54
Moss & Lichen	32	20- 40
Basal Vegetation	12	9 - 15
Water	9	0 - 24

Soils

GREAT GROUPS: Typic Cryofibrists; Fluvaquentic Cryofibrists

PARTICLE SIZE CLASS: Fine loamy

AVERAGE COARSE FRAGMENTS: Range from 0 to 20%

WATER TABLE AND MOTTLING DEPTH: Water table at or near the surface; mottling absent to occurring between 24 to 34 inches

ROOTING DEPTH: 15 to 31 inches of rooting zone

Succession /Management Implications

Youngblood and others (1985) suggest a gradual conversion from the *Salix wolfii*/*Carex rostrata* type to the *Salix wolfii*/*Carex aquatilis* type, as organic layers build from the contribution of litter, and free oxygen becomes available with the lateral movement of water. The site becomes more suitable for *Carex aquatilis* to gradually replace *Carex rostrata* (Padgett *et al.* 1989). If the *Salix wolfii*/*Carex aquatilis* community type becomes drier, there may be a transition toward the *Salix wolfii*/Mesic forb type or the *Salix wolfii*/*Deschampsia cespitosa* type. Heavy grazing may lead to the replacement of the sedges by graminoids such as *Juncus balticus* and *Poa pratensis* (Hansen *et al.* 1995). The wet soils of the *Salix wolfii*/*Carex aquatilis* stands are easily compacted by livestock. Sheep may browse the willows and cattle are likely to graze the *Carex aquatilis* in the wetter areas. Evidence of use by cattle, moose and elk was present in our stands of this community type. Over browsing could lead to elimination of *Salix wolfii* and dominance of sedges (Hansen *et al.* 1995).

Geographic Distribution & Other Studies

Our stands of the *Salix wolfii*/*Carex aquatilis* community type are most similar to the *Salix wolfii*/*Carex aquatilis* habitat typed described from central and southwestern Montana (Hansen *et al.* 1995). (There was no *Carex vesicaria* in our stands of this community type, but cover of *Carex rostrata* was occasionally equal to or greater than that of *Carex aquatilis*.) They are also similar to the vegetation from the *S. wolfii*/*C. aquatilis* habitat type of Mattson (1984) from the Yellowstone Plateau. Other researchers have separated a *Salix wolfii*/*Carex rostrata* type from the *Salix wolfii*/*Carex aquatilis* type. Most of our stands agree with the *Salix wolfii*/*Carex aquatilis* community described from eastern Idaho and western Wyoming (Youngblood *et al.* 1985), northeastern Utah (Padgett *et al.* 1989), and Colorado (Kittel *et al.* 1994; Kettler and McMullen 1996).



Figure 6 Clint Creek area, Wind River Ranger District.

***Salix wolfii*/Mesic forb Community Type
(Wolf's willow/Mesic forb Community Type)**

Number of Stands Sampled = 1
(145V95N035)

General Description

The single stand of this community type that we sampled on the Shoshone National Forest occurred next to a small, meandering subalpine channel in the Wind River Ranger District. A dense, mixed low-shrub layer dominated by *Salix wolfii* and a dense herbaceous layer with a variety of forbs common to mesic environments characterize the *Salix wolfii*/Mesic forb community type. There is no single forb that dominates the herbaceous layer.

Location and Environment

This sample was taken from within the Southern Wind River subsection in an area of unconsolidated granitic alluvium.

One stand of the *Salix wolfii*/Mesic forb community type was sampled along the South Fork of Warm Spring Creek at 9,260 ft elevation, along a stream channel 9 ft. wide and 1 ft. deep. The banks were well stabilized by sedges and rocks with some undercutting and bankfull. The occurrence is separated from the channel by a narrow fringe of *Carex*. The *Salix wolfii*/Mesic forb community type occupies most of the riparian zone, ca. 300 ft. wide. The occurrence slopes toward the channel on hummocky ground with old dry channels throughout. Surrounding the riparian zone are low, rolling sagebrush hills.

Site Characteristics

Parent Material	Volcanic alluvium
Landform	Wide valley bottoms
Plot Position	Floodplain
Elevation (ft)	9,260
Precipitation (in.)	40-45

Vegetation Structure and Composition

The stand of the *Salix wolfii*/Mesic forb community type is dominated by a shrub layer of *Salix wolfii* with small amounts of *Pentaphylloides floribunda* (syn. *Potentilla fruticosa*) and *Betula glandulosa*. The shrub layer is 2 to 3 ft tall. Most shrubs are vigorous with few dead stems. The herbaceous layer is fairly dense and is dominated by forbs of mesic environments. *Lupinus polyphyllus*, *Potentilla gracilis*, *Aster foliaceus*, and *Caltha leptosepala* are the most important species, but no single forb dominates the stand. Graminoids are represented by a mix of sedges and grasses.

Community Structure

Percent canopy cover by life form and size class.

	MEAN
	%
SHRUBS	80
Low	80
GRAMINOIDS	30
FORBS	60

Ground Cover

Percent cover of features on plot surface.

	MEAN
	%
Bare Soil	9
Stones (10 - 24 in)	3
Boulders (> 24 in)	7
Litter & Duff	40
Moss & Lichen	28
Basal Vegetation	13

Soils

GREAT GROUP: Typic Cryaquolls

PARTICLE SIZE CLASS: Coarse loamy

AVERAGE COARSE FRAGMENTS: 21%

WATER TABLE AND MOTTLING DEPTH: Water table at 6 inches; mottling occurring at 6 inches

ROOTING DEPTH: 11 inches of rooting zone

Succession/Management Implications

Padgett and others (1989) consider the *Salix wolfii*/Mesic forb community type to be a stable type. Wild ungulates may have an easier time than domestic livestock in browsing the *Salix wolfii*/Mesic forb community type, due to the dense shrub layer (Youngblood *et al.* 1985). Game trails and scat of cows and moose were present in our occurrence of this community type. There were few exotic species in the stand, but there were some forbs that are considered to increase with disturbance, including *Taraxacum officinale*, *Trifolium longipes*, and *Fragaria virginiana*.

Geographic Distribution & Other Studies

This community is similar to the *Salix wolfii*/Mesic forb communities described from eastern Idaho and western Wyoming (Youngblood *et al.* 1985), from northern Utah (Padgett *et al.* 1989), and from the Routt National Forest in northern Colorado (Kettler and Mc Mullen 1996). Some of the forbs in our stand differed from those of the other studies.



Figure 7 Southfork Warm Spring Creek, Wind River Ranger District

***Salix wolfii/Deschampsia cespitosa* Community Type
(Wolf's willow/Tufted hairgrass Community Type)**

Number of Stands Sampled = 3
(145V95N005, 145V95N040, 141V93N033)

General Description

On the Shoshone National Forest, the *Salix wolfii/Deschampsia cespitosa* community type occurs along small, low gradient streams and along perennial rivers with moderate gradients. These water courses are found in moderately-wide and wide valleys. A low, usually dense shrub canopy of *Salix wolfii*, often with large amounts of *Pentaphylloides floribunda* (syn. *Potentilla fruticosa*), creates the upper canopy. A mixture of graminoids and forbs are present, most of which are not restricted to wet or mesic environments. *Deschampsia cespitosa* is the dominant, or one of the dominant, herbaceous species.

Location and Environment

Samples of this type occurred in three subsections on the Forest. Within the Beartooth subsection, the plot was located in a granitic valley bottom landscapes on river floodplains in montane to subalpine areas. Geology is primarily unconsolidated, mixed alluvium. Within the Upper Wind River subsection, a plot occurred within an area of precambrian igneous and metamorphic rocks. In the Wind River subsection, a sample with a parent material derived from unconsolidated, mixed volcanic alluvium was observed.

Stands of the *Salix wolfii/Deschampsia cespitosa* community type were sampled along the Clarks Fork of the Yellowstone River in the Clarks Fork Ranger District and along Charlie Creek and Canyon Creek in the Wind River Ranger District. These are small to medium-sized, single channels ranging in width from 3 ft. to 10 ft. Elevations of the sites range from 6,870 ft. to 9,070 ft. One site contains a small pond that is filling with sedges, and the *Salix wolfii/Deschampsia cespitosa* community type occurs adjacent to this wet meadow, on saturated soil with standing water. At another site, the *Salix wolfii/Deschampsia cespitosa* community type is separated from the channel by a narrow *Salix boothii/Carex aquatilis* stand. At the third site the occurrence is on a wet terrace next to an overflow channel and is influenced by hillside runoff in addition to the river. The floodplains and terraces containing the community type are up to 4.8 ft above bankfull channel height. The patches are generally 40 m by 50 m in area.

The micro topography of these stands is uneven, with hummocks beneath the low shrubs, particularly the *Pentaphylloides floribunda* (syn. *Potentilla fruticosa*). Moss is common to all three stands. Litter and exposed soil contribute substantially to the ground cover.

Site Characteristics

Parent Material	Granitic, volcanic alluvium
Landform	Medium - wide valley bottom
Plot Position	Floodplain, terrace
Elevation (ft)	6,870 - 9,070
Precipitation (in.)	15-30

Vegetation Structure and Composition

Low and medium shrubs dominate the vegetation of the *Salix wolfii/Deschampsia cespitosa* community type. The shrub canopy can be moderately open to dense. *Salix wolfii* is the most abundant shrub, and *Pentaphylloides floribunda* (syn. *Potentilla fruticosa*) can be codominant. Other shrubs may include *Betula glandulosa* and *Salix boothii*. Scattered conifers may be present. The shrubs overlie a dense herbaceous layer of mixed graminoids and forbs. *Deschampsia cespitosa* is the dominant graminoid, and *Carex microptera* and *Poa pratensis* may also be abundant. The common forbs include *Aster foliaceus*, *Fragaria virginiana*, and *Geum macrophyllum*. One stand had large amounts of *Senecio pseud aureus* and *Senecio pauperculus*.

.Community Structure

Percent canopy cover by life form and size class.

	MEAN RANGE	
	%	%
TREES	3.3	0 - 10
Pole	3.3	0 - 10
Medium	3.3	0 - 10
SHRUBS	67	50 - 80
Low	63	40 - 80
Medium	13	0 - 30
GRAMINOIDS	37	30 - 50
FORBS	37	30 - 40

Ground Cover

Percent cover of features on plot surface.

	MEAN RANGE	
	%	%
Bare Soil	23	5 - 53
Litter & Duff	24	14 - 35
Moss & Lichen	34	20 - 60
Basal Vegetation	12	11 - 13
Water	13	0 - 40

Soils

GREAT GROUPS: Typic Cryaquepts; Typic Cryaquolls

PARTICLE SIZE CLASS: Fine loamy

AVERAGE COARSE FRAGMENTS: Range from 0 to 5%

WATER TABLE AND MOTTLING DEPTH: Water table at 0 to 11 inches; mottling occurring at 6 to 11 inches

ROOTING DEPTH: 8 to 23 inches of rooting zone

Succession/Management Implications

The *Salix wolfii/Deschampsia cespitosa* community type can be a stable type. Over a long time, there may be a very gradual shift toward the *Pentaphylloides floribunda* (syn. *Potentilla fruticosa*)/*Deschampsia cespitosa* community type (Chadde 1988). Two other successional directions for this community type have been suggested. Our three sampled stands of the *Salix wolfii/Deschampsia cespitosa* community type may be shifting toward the *Salix wolfii*/Mesic forb community type. Padgett and others (1989) felt that these two types are closely related because of the strong similarity of their soil and water features. Another scenario, with prolonged grazing, is an increase of *Poa pratensis* over *Deschampsia cespitosa*.

Salix wolfii can reach 6 ft. tall when intermingled by other shrubs that prevent it from being heavily grazed (Brunsfield and Johnson 1985). These stands are usually well drained, which may lead to heavier grazing pressure (Hansen *et al.* 1995). At our three sampled stands, the height of *Salix wolfii* was maintained at 2 ft. Browse on the past year's willow stems and grazing to the herbaceous layer was evidenced at the stands. Scat and trails of moose, cow, and elk were present.

Geographic Distribution & Other Studies

The *Salix wolfii/Deschampsia cespitosa* community type has been described from western Wyoming (Youngblood *et al.* 1985), the northern Yellowstone region (Chadde 1988), northern and central Utah (Padgett *et al.* 1989), and central and southwestern Montana (Hansen *et al.* 1995).



Figure 8 Clarks Fork River, Clarks Fork Ranger District.

***Salix wolfii*/*Poa pratensis* Community Type
(Wolf's willow/Kentucky bluegrass Community Type)**

Number of Stands Sampled = 2
(145V95N013, 141V93N028)

General Description

On the Shoshone National Forest, the *Salix wolfii*/*Poa pratensis* community can be found beside small or medium- sized channels in both the Clarks Fork and Wind River Ranger Districts. The shrub layer can be patchy to dense, with *Salix wolfii* dominating. The herbaceous layer consists of a mix of graminoids and forbs. *Poa pratensis* is dominant or co-dominant in the graminoid layer. These stands have a large amount of non-native grasses and forbs.

Location and Environment

A sample of this type occurred within the Beartooth subsection within river floodplains in granitic till valley bottoms. The other sample was located in the Upper Wind River subsection with parent material influenced by the sedimentary Aycross Formation.

Stands of the *Salix wolfii*/*Poa pratensis* community were sampled near a side channel of the Clarks Fork of the Yellowstone River at 6,990 ft. elevation and along Warm Spring Creek at 8,820 ft. elevation. The channels are 3 ft. to 10 ft. wide, ca. 1 ft. deep, meandering, and low gradient. Banks are stable and well vegetated. There are undercuts and higher erosion at the outside meanders.

The floodplain surfaces containing the community type are ca. 0.8 ft above bankfull channel height. The ground surface is relatively level, with abandoned stream channels up to 3 ft. deep. Adjacent communities are conifer stands with herbaceous understories or wet *Carex aquatilis* meadows.

Site Characteristics

Parent Material	Granitic, volcanic alluvium
Landform	Moderate - wide valley bottom
Plot Position	Floodplain
Elevation (ft)	6,990 - 8,820
Precipitation (in.)	20-35



Vegetation Structure and Composition **Figure 9** Warm Spring Creek, Wind River Ranger District

The *Salix wolfii*/*Poa pratensis* community consists of a low shrub layer dominated by medium to dense *Salix wolfii*. At the dense stand, *Salix wolfii* and small amounts of *Salix drummondiana* and *Salix boothii* are all 4 ft. tall. At the more open stand, the *Salix wolfii* have been maintained by browsing at height averaging 1 ft tall.

The herbaceous vegetation is indicative of heavy grazing. The dominant graminoid is *Poa pratensis*. Important native species are *Carex microptera* and *Carex norvegica*. The forbs vary between stands: *Fragaria virginiana* is the dominant species in one stand, and *Trifolium repens* has the highest cover in the other stand. Both these forbs increase with grazing or disturbance.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
SHRUBS	55	30 - 80
Low	25	20 - 30
Medium	35	0 - 70
GRAMINOIDS	40	40
FORBS	45	30 - 60

Ground Cover

Percent cover of features on plot surface.

	MEAN	RANGE
	%	%
Bare Soil	26	10 - 42
Gravel (2 mm - 3 in)	8	0 - 15
Cobbles (3 - 10 in)	5	0 - 10
Litter & Duff	55	21 - 88
Basal Vegetation	12	12

Soils

GREAT GROUPS: Typic Cryaquolls; Typic Cryofluvents

PARTICLE SIZE CLASS: Loamy skeletal

AVERAGE COARSE FRAGMENTS: Range from 50 TO 65%

WATER TABLE AND MOTTLING DEPTH: Water table at the surface to 8 inches; mottling occurring at 0 to 2 inches

ROOTING DEPTH: 7 to 12 inches of rooting zone

Succession/Management Implications

Stands of the *Salix wolfii/Poa pratensis* community type apparently result from heavy grazing that has shifted dominance of the herbaceous layer from wet sedge species (*Carex microptera*, *Carex norvegica* and *Carex petasata* in our stands) to species tolerant of drier, more compact soils, such as *Poa pratensis* (Hansen *et al.* 1995). Girard *et al.* (1995) note that *Salix wolfii* may decrease with continued disturbance, leading to a *Poa pratensis/Taraxacum officinale* type.

Evidence of use by cattle was present at both stands. The stand with patchier willow also showed evidence of horse and human use. The more dense willow site on the smaller channel has signs of current and past beaver activity: cut willows, dams, and slides into the water. There also are signs of use by moose in this stand.

Geographic Distribution & Other Studies

The *Salix wolfii/Poa pratensis* community from the Shoshone National Forest is similar to a *Salix wolfii/Poa* community type described from the Bighorn National Forest (Girard *et al.* 1995), which also is a disturbed type in which *Poa pratensis* is the dominant grass with low amounts of *Carex* species.

***Salix wolfii*/*Poa pratensis* Community Type
(Wolf's willow/Kentucky bluegrass Community Type)**

Number of Stands Sampled = 2
(145V95N013, 141V93N028)

General Description

On the Shoshone National Forest, the *Salix wolfii*/*Poa pratensis* community can be found beside small or medium- sized channels in both the Clarks Fork and Wind River Ranger Districts. The shrub layer can be patchy to dense, with *Salix wolfii* dominating. The herbaceous layer consists of a mix of graminoids and forbs. *Poa pratensis* is dominant or co-dominant in the graminoid layer. These stands have a large amount of non-native grasses and forbs.

Location and Environment

A sample of this type occurred within the Beartooth subsection within river floodplains in granitic till valley bottoms. The other sample was located in the Upper Wind River subsection with parent material influenced by the sedimentary Aycross Formation.

Stands of the *Salix wolfii*/*Poa pratensis* community were sampled near a side channel of the Clarks Fork of the Yellowstone River at 6,990 ft. elevation and along Warm Spring Creek at 8,820 ft. elevation. The channels are 3 ft. to 10 ft. wide, ca. 1 ft. deep, meandering, and low gradient. Banks are stable and well vegetated. There are undercut and higher erosion at the outside meanders.

The floodplain surfaces containing the community type are ca. 0.8 ft above bankfull channel height. The ground surface is relatively level, with abandoned stream channels up to 3 ft. deep. Adjacent communities are conifer stands with herbaceous understories or wet *Carex aquatilis* meadows.

Site Characteristics

Parent Material	Granitic, volcanic alluvium
Landform	Moderate - wide valley bottom
Plot Position	Floodplain
Elevation (ft)	6,990 - 8,820
Precipitation (in.)	20-35



Vegetation Structure and Composition **Figure 9** Warm Spring Creek, Wind River Ranger District

The *Salix wolfii*/*Poa pratensis* community consists of a low shrub layer dominated by medium to dense *Salix wolfii*. At the dense stand, *Salix wolfii* and small amounts of *Salix drummondiana* and *Salix boothii* are all 4 ft. tall. At the more open stand, the *Salix wolfii* have been maintained by browsing at height averaging 1 ft tall.

The herbaceous vegetation is indicative of heavy grazing. The dominant graminoid is *Poa pratensis*. Important native species are *Carex microptera* and *Carex norvegica*. The forbs vary between stands: *Fragaria virginiana* is the dominant species in one stand, and *Trifolium repens* has the highest cover in the other stand. Both these forbs increase with grazing or disturbance.

Community Structure

Percent canopy cover by life form and size class.

	MEAN RANGE	
	%	%
SHRUBS	55	30 - 80
Low	25	20 - 30
Medium	35	0 - 70
GRAMINOIDS	40	40
FORBS	45	30 - 60

Ground Cover

Percent cover of features on plot surface.

	MEAN RANGE	
	%	%
Bare Soil	26	10 - 42
Gravel (2 mm - 3 in)	8	0 - 15
Cobbles (3 - 10 in)	5	0 - 10
Litter & Duff	55	21 - 88
Basal Vegetation	12	12

Soils

GREAT GROUPS: Typic Cryaquolls; Typic Cryofluvents

PARTICLE SIZE CLASS: Loamy skeletal

AVERAGE COARSE FRAGMENTS: Range from 50 TO 65%

WATER TABLE AND MOTTLING DEPTH: Water table at the surface to 8 inches; mottling occurring at 0 to 2 inches

ROOTING DEPTH: 7 to 12 inches of rooting zone

Succession/Management Implications

Stands of the *Salix wolfii/Poa pratensis* community type apparently result from heavy grazing that has shifted dominance of the herbaceous layer from wet sedge species (*Carex microptera*, *Carex norvegica* and *Carex petasata* in our stands) to species tolerant of drier, more compact soils, such as *Poa pratensis* (Hansen *et al.* 1995). Girard *et al.* (1995) note that *Salix wolfii* may decrease with continued disturbance, leading to a *Poa pratensis/Taraxacum officinale* type.

Evidence of use by cattle was present at both stands. The stand with patchier willow also showed evidence of horse and human use. The more dense willow site on the smaller channel has signs of current and past beaver activity: cut willows, dams, and slides into the water. There also are signs of use by moose in this stand.

Geographic Distribution & Other Studies

The *Salix wolfii/Poa pratensis* community from the Shoshone National Forest is similar to a *Salix wolfii/Poa* community type described from the Bighorn National Forest (Girard *et al.* 1995), which also is a disturbed type in which *Poa pratensis* is the dominant grass with low amounts of *Carex* species.

***Salix barclayi* - *Salix wolfii* dominated stand
Barclay willow - Wolf's willow dominated stand**

Number of Stands Sampled = 1
(141V93N031)

General Description

On the Shoshone National Forest, we sampled one willow stand dominated by *Salix barclayi* and *Salix wolfii*. This small stand was located in the wide valley of the Clarks Fork of the Yellowstone River at 6,950 ft. elevation, at the base of a hillslope where a small creek spreads across a low area. The soil of the occurrence is saturated peat. The stand occupies a small area contained within a *Salix wolfii*/*Carex rostrata* stand. The stand is also adjacent to a spruce forest on the hillside. Scattered spruce in the stand appear to be unhealthy. The open shrub layer is composed of low *Salix barclayi* and *Salix wolfii*. The herbaceous layer contains few species (primarily graminoids) and is at least as tall as the shrubs. *Juncus balticus* is dominant, and *Carex rostrata* and *Carex aquatilis* are also abundant. The most common forb is *Aster foliaceus*.

Location and Environment

This plot was found in the Beartooth subsection occurring in river floodplains developed from mixed granitic till.

Soils

GREAT GROUP: Typic Cryofibrist

PARTICLE SIZE CLASS: Fine loamy

AVERAGE COARSE FRAGMENTS: none

WATER TABLE AND MOTTLING DEPTH: Water table at or near the surface; mottling absent

ROOTING DEPTH: 12 inches of rooting zone



Figure 10 Clarks Fork River,
Clarks fork Ranger District.

Salix wolfii
Wolf's willow unclassified stand

Number of Stands Sampled = 1
 (145V95N019)

General Description

We sampled one *Salix wolfii* stand that fits none of the community types from the Shoshone National Forest or from other study areas. The stand is in the Wind River Ranger District near Parque Creek at 9,140 ft elevation, in a wide valley on a large section of floodplain inside a meander of a medium-sized channel. The substrate is very coarse. This stand occurred next to a younger *Salix wolfii* bar community, a more mature *Salix wolfii*/*Carex aquatilis* stand, and a *Deschampsia cespitosa* meadow.

Location and Environment

This sample, from the Wind River subsection, occurred in alluvium influenced by the Bighorn Dolomite Formation.

The stand is characterized by an open canopy of small clumps of *Salix wolfii* 1.5 ft tall. The herbaceous layer is rather open, and is thin beneath the willows. Forbs contribute more cover than do grasses and sedges, but the presence of non-riparian species causes this stand to fit poorly into named communities. The ground surface is mostly bare, with a thin layer of duff and mosses in spots.

Soils

GREAT GROUP: Typic Cryofluvent
 PARTICLE SIZE CLASS: Loamy skeletal
 AVERAGE COARSE FRAGMENTS: 40 %
 WATER TABLE AND MOTTLING DEPTH: Water table at 28 inches; mottling absent
 ROOTING DEPTH: 6 inches of rooting zone

Site Characteristics

Parent Material	Volcanic alluvium
Landform	Valley bottom
Plot Position	Flood plain
Elevation (ft)	9100
Precipitation (in.)	30 - 40

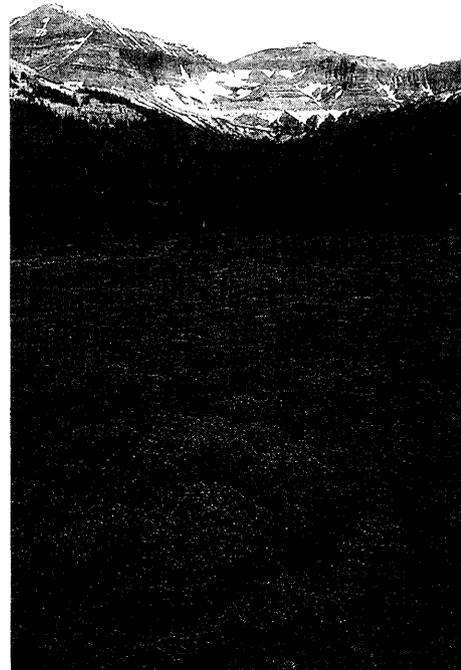


Figure 11 Parque Creek, Wind River Ranger District.

***Salix eastwoodiae*/Mesic graminoid Community Type (tentative)
Eastwood's willow/Mesic graminoid Community Type (tentative)**

Number of Stands Sampled = 2
(145V95N045, 141V96N019)

General Description

Two examples of shrub stands dominated by *Salix eastwoodiae* were sampled on the Shoshone National Forest, one along a wide stream channel and the other along a narrow, alpine stream channel. In both stands, the willow forms a shrub layer ca. 3 feet tall above a dense herbaceous layer. These stands are tentatively considered part of a *Salix eastwoodiae*/Mesic graminoid community type, which has not been described in other studies from nearby areas.

Salix eastwoodiae is difficult to distinguish from *Salix wolfii*: both have silvery pubescence on similarly-shaped leaves, both generally are short, and both have pubescent capsules. The two species may hybridize where they meet (Brunsfeld and Johnson 1985). Hence some willow stands identified in other studies as *Salix wolfii* types may actually have been *Salix eastwoodiae* stands. This may explain why so few *Salix eastwoodiae* community types have been described to date.

Location and Environment

A sample from the Beartooth subsection occurring in a granitic alpine landscape, occurring on the Beartooth Mountains Formation. The sample from the Wind River subsection occurred in parent material derived from the Tepee Trail Formation.

One stand was sampled at 9,580 ft. elevation on the Beartooth Plateau, and occurred along narrow stream channels on the lower slopes of a subalpine valley. This willow occurrence includes several patches of shrubland mixed with *Carex scopulorum* wet meadows and drier graminoid meadows, in a mosaic across the valley floor and lower slopes.

The other stand of a tentative *Salix eastwoodiae*/Mesic graminoid community type was sampled at 8,125 ft. elevation along Frontier Creek, a braided stream ca. 200 ft. wide flowing through a wide valley vegetated primarily with coniferous forest. The riparian zone occupies the floodplain, is ca. 700 ft. wide, and supports a mosaic of coniferous forest and meadows. The *Salix eastwoodiae*/Mesic graminoid stand occupies an open meadow with a hummocky surface, and is bordered by coniferous forest.

Site Characteristics

Parent Material	Volcanic
Landform	Wide valley
Plot Position	Floodplain
Elevation (ft)	8,125-9,600
Precipitation (in.)	30-65

Vegetation Structure and Composition

Salix eastwoodiae forms an open canopy of small, widely spaced shrubs averaging 1 ft. tall. Smaller amounts of *Salix planifolia*, *S. boothii*, *S. geyeriana*, and *Pentaphylloides floribunda* (syn. *Potentilla fruticosa*) may be present. The herbaceous layer is dense and dominated by graminoids, primarily *Carex praegracilis*, *Deschampsia cespitosa* (2 ft. tall), and *Juncus balticus*. Common forbs are *Aster foliaceus*, *Fragaria virginiana*, and *Senecio sphaerocephalum*. The ground surface is covered with a thin layer of duff, with some areas of moss and bare soil.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
TREES	1.5	0 - 3
Saplings	1.5	0 - 3
Poles	1.5	0 - 3
SHRUBS	40	30 - 50
Low	35	30 - 40
Medium	6	3 - 10
GRAMINOIDS	55	30 - 80
FORBS	30	20 - 40

Ground Cover

Percent cover of features on plot surface

	MEAN	RANGE
	%	%
Bare Soil	7	5 - 10
Litter & Duff	55	30 - 80
Wood (>1/4 in. diam.)	1	0 - 1
Moss & Lichen	20	10 - 30



Figure 12 Little Rock Creek, below Christmas Lake, Clarks Fork Ranger District.

Soils

GREAT GROUP: Typic Cryaquepts

PARTICLE SIZE CLASS: Fine loamy

AVERAGE COARSE FRAGMENTS: 20%

WATER TABLE AND MOTTLING DEPTH: Water table at or near the surface; mottling occurring at 4 inches

ROOTING DEPTH: 12 inches of rooting zone

Succession/Management Implications

More stands of the *Salix eastwoodiae* type must be sampled before we can identify community types within this dominance type and before we can understand successional relationships between the community types.

Geographic Distribution & Other Studies

Communities dominated by *Salix eastwoodiae* are uncommon. They have been described from central Idaho (Mutz and Queiroz 1983) and from the Teton Range of Wyoming (Youngblood *et al.* 1995).

***Salix eastwoodiae/Carex aquatilis* Community Type
(Eastwood’s willow/Water sedge Community Type)**

Number of Stands Sampled = 4
(145V95N033, 145V95N044, 145V95N047, 141V93N043)

General Description

On the Shoshone National Forest the *Salix eastwoodiae/Carex aquatilis* community type can be found at high elevations, above 8,900 ft. *Salix eastwoodiae* generally dominates a shrub layer 3 ft. to 5 ft. tall, and *Salix planifolia* usually contributes nearly as much cover. The herbaceous layer is dense and dominated by sedges, particularly *Carex aquatilis*.

Location and Environment

Two plots were located in the Upper Wind River subsection. Parent material in these areas is derived from volcanic landslide deposits and the Wiggins Formation consisting of volcanic sandstone, siltstone, conglomerate, and breccia. Within the Southern Wind River subsection, this type occurred on parent material derived from primarily granitic moraine deposits. Within the Beartooth subsection, a plot occurred within glacial scoured granitic uplands in subalpine areas. Parent material is derived from the Precambrian granitic Beartooth Mountains Formation.

Stands of the *Salix eastwoodiae/Carex aquatilis* community type are found along Bonneville Creek at the inlet to Brook’s Lake, at Bonneville Pass, along Snowshoe Creek, and below Clay Butte at elevations between 8,900 ft. and 9,920 ft. They are located in depressions or on wet hillsides, near small, low-order stream channels or seeps. At the more level sites, the ground is hummocky and cut with small, marshy channels. Litter, moss, bare soil, and water cover most of the soil surface.

These stands were located adjacent to a *Carex aquatilis* meadow, a low *Salix planifolia/Carex aquatilis* stand, another *Salix eastwoodiae* riparian community along the channel which has received much heavier cattle grazing, and *Picea engelmannii* upland forests.

Site Characteristics

Parent Material	Volcanic, granitic alluvium
Landform	Wide valley bottoms
Plot Position	Floodplain, lower hillslopes
Elevation (ft)	8,980 - 9,920
Precipitation(in.)	40-50



Vegetation Structure and Composition **Figure 13** Bonneville Pass area, Wind River Ranger District.

Most stands of the *Salix eastwoodiae/Carex aquatilis* community type have dense shrub canopies of *Salix eastwoodiae* and *Salix planifolia*, ranging from 3 ft. to 5 ft. tall. The willows are mostly vigorous with few dead stems. The herbaceous layer is usually dominated by sedges. *Carex aquatilis* is always present, and other species that may contribute substantial cover are *Carex rostrata*, *C. norvegica*, and *C. microptera*. Forbs are diverse but usually less abundant. One stand has a large amount of *Erigeron peregrinus*.

Community Structure

Percent canopy cover by life form and size class.

	MEAN %	RANGE %
TREES		
Seedlings	2.5	0 - 10
Poles	2.5	0 - 10
SHRUBS	85	70 - 90
Low	23	10 - 50
Medium	65	20 - 90
GRAMINOIDS	60	20 - 80
FORBS	28	10 - 50

Ground Cover

Percent cover of features on plot surface.

	MEAN %	RANGE %
Bare Soil	13	2 - 25
Litter & Duff	41	8 - 64
Wood (> 1/4 in. diam.)	2	0 - 7
Moss & Lichen	24	10 - 50
Basal Vegetation	11	10 - 12
Water	10	5 - 20

Soils

GREAT GROUPS: Typic Cryofibrists; Fluvaquentic Cryofibrists; Typic Cryaquepts

PARTICLE SIZE CLASS: Fine loamy, Coarse loamy

AVERAGE COARSE FRAGMENTS: Range from 0 to 21%

WATER TABLE AND MOTTLING DEPTH: Water table at or near the surface; mottling absent to ranging from 6 to 38 inches depending on Histic horizon depth

ROOTING DEPTH: 33 inches of rooting zone

Succession/Management Implications

Soil texture can determine which sedge species are present in stands of the *Salix eastwoodiae*/*Carex aquatilis* community type. *Carex aquatilis* is present on relatively coarse textured soils close to streams, while *Carex rostrata* occurs on poorly drained, fine-textured soils (Mutz and Queiroz 1983). The roots of the sedges and willows stabilize the otherwise erodible soils. Overgrazing of the herbaceous component would lead to accelerated erosion.

Evidence of animals using our stands included cow and elk scat, some willow browsing, and some grazing to the herbaceous layer. The willow stands are relatively tall and not heavily browsed. The hillslope stand is much less impacted than the adjacent stream bottom community.

The *Salix eastwoodiae* - *Salix planifolia*/*Carex aquatilis* community type is a wet, high elevation community. Its elevation suggests that *Salix planifolia* var. *monica* rather than var. *planifolia* would be the variety present, but our four stands contained either variety.

Geographic Distribution & Other Studies

Salix eastwoodiae is difficult to distinguish from *Salix wolfii*: both have silvery pubescence on similarly-shaped leaves, both generally are short, and both have pubescent capsules. The two species may hybridize where they meet (Brunsfield and Johnson 1985). Hence some willow stands identified in other studies as *Salix wolfii* types may actually have been *Salix eastwoodiae* stands, and the *Salix eastwoodiae*/*Carex aquatilis* community type may be more common than is suggested in the literature.

The stands in this community type from the Shoshone National Forest are similar in species composition to the *Salix eastwoodiae*/*Carex rostrata*-*Carex aquatilis* community type described from the South Fork of the Salmon River in Idaho (Mutz and Queiroz 1983). Keeping in mind the difficulty of distinguishing *Salix eastwoodiae* from *S. wolfii*, our stands resemble in species composition and vegetation structure the *Salix wolfii* *Salix planifolia* var. *monica* community described from the Bighorn Mountains (Girard *et al.* 1995).

***Salix planifolia/Carex aquatilis* Community Type (Planeleaf willow/Water sedge Community Type)**

Number of Stands Sampled = 4
(145V96N023, 145V95N034, 141V96N054, 141V96N059)

General Description

On the Shoshone National Forest the *Salix planifolia/Carex aquatilis* community type can be found next to narrow, meandering streams, in abandoned meanders, and near lake shores. *Salix planifolia* var. *monica* dominates a shrub layer less than 4 ft. tall. The dense herbaceous layer is dominated by sedges of wet areas, particularly *Carex aquatilis* and *C. rostrata*.

Location and Environment

Sample plots from the Beartooth subsection occurred in areas characterized by montane granitic till deposits and montane to subalpine granitic valley bottoms and lakebed deposits. Parent material is derived from undifferentiated granitic moraine deposits, and the Beartooth Mountains Formation. Plots in the Southern Wind River subsection occurred on parent material derived from primarily granitic moraine deposits.

Stands of the *Salix planifolia/Carex aquatilis* community type were sampled along Geyser Creek, above Grandy Reservoir, at the south end of Little Moose Lake, and in the valley of Muddy Creek, between elevations of 7,980 ft. and 9,380 ft. These stands occupy stream floodplains and flats near lakes. The micro-topography in the stands is hummocky, and standing water fills small depressions. Litter, moss, some bare soil, and open water cover the surfaces of the stands.

The *Salix planifolia/Carex aquatilis* stands are adjacent to *Carex aquatilis* meadows, *Salix boothii*/Mesic graminoid stands, and *Calamagrostis canadensis* meadows. *Picea engelmannii* forests occur on the adjacent upland terrain.

Site Characteristics

Parent Material	Granitic alluvium
Landform	Medium to wide valleys bottoms
Plot Position	Floodplains
Elevation (ft.)	7,980 - 9,380
Precipitation (in.)	20-45

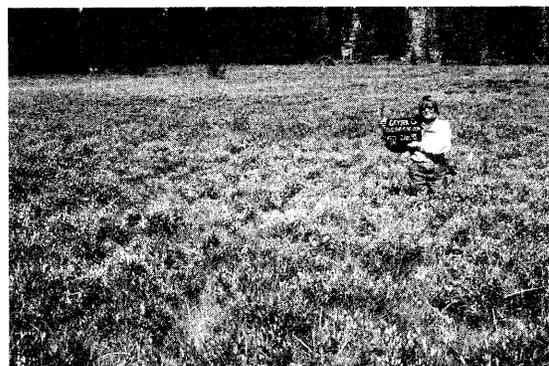


Figure 14 Geyers Creek, Wind River Ranger District.

Vegetation Structure and Composition

Salix planifolia var. *monica* dominates a patchy, woody canopy of low shrubs, which may also contain small amounts of *Salix boothii* and *Pentaphylloides floribunda* (syn. *Potentilla fruticosa*). The herbaceous layer is dense and dominated by sedges, of which *Carex aquatilis* is most abundant. *Carex rostrata* is also present and *C. canescens* may be abundant. Forbs, particularly *Aster occidentalis* and *Senecio sphaerocephalum*, may contribute substantial cover or may be present in small amounts. Conifer seedlings and saplings may grow in the stands.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
TREES	1	0 - 3
Seedlings	1	0 - 3
Saplings	1	0 - 3
SHRUBS	50	20 - 80
Low	50	20 - 80
GRAMINOIDS	65	40 - 80
FORBS	9	1 - 30

Ground Cover

Percent cover of features on plot surface.

	MEAN	RANGE
	%	%
Bare Soil	26	0 - 80
Litter & Duff	29	10 - 43
Moss & Lichen	33	0 - 60
Basal Vegetation	13	9 - 25
Water	4	0 - 15

Soils

GREAT GROUPS: Histic and Typic Cryaquolls

PARTICLE SIZE CLASS: Fine loamy, Coarse loamy

AVERAGE COARSE FRAGMENTS: Range from 0 to 30%

WATER TABLE AND MOTTLING DEPTH: Water table at or near the surface; mottling occurring between 4 and 18 inches

ROOTING DEPTH: 18 to 29 inches of rooting zone

Succession/Management Implications

Sites with the *Salix planifolia/Carex aquatilis* community type are often the wettest terrestrial sites available for willow species (Hansen *et al.* 1995). Beaver can play a vital role in maintaining a high water table and thus allowing the *Salix planifolia/Carex aquatilis* community type to persist. If the channel downcuts, the water table will drop, with a resulting increase of *Juncus balticus*, *Poa pratensis*, and forbs (Hansen *et al.* 1995). Succession toward other *Salix planifolia* types would require drying and decomposition of organic materials, and probably is an extremely slow process (Padgett *et al.* 1989).

Cow and moose scat were present in two stands of the *Salix planifolia/Carex aquatilis* community type. Utilization of the sedge species of the *Salix planifolia/Carex aquatilis* community type is variable and depends on the condition of nearby upland graminoids. The willow species are more vulnerable to pruning damage during late summer and fall grazing; rest and deferred rotation is recommended (Myers 1989 in Hansen *et al.* 1995). Wildlife use of *Salix planifolia* in the winter can be heavy if snow does not cover the shrubs.

Geographic Distribution & Other Studies

The *Salix planifolia/Carex aquatilis* community type is a major type in the Uinta Mountains of Utah (Padgett *et al.* 1989) and a minor type at middle to high elevations in Montana (Hansen *et al.* 1995). It has also been described from the Bighorn National Forest in Wyoming (Girard *et al.* 1995), the Routt National Forest of Colorado (Kettler and McMullen 1996), and the Yellowstone Plateau (Mattson 1984), on the *C. aquatilis/Salix phyllifolia* habitat type.

***Salix planifolia/Carex scopulorum* Community Type
(Planeleaf willow/Mountain sedge Community Type)**

Number of Stands Sampled = 4
(141V93N037, 141V96N017, 141V96N031, 141V96N018)

General Description

Four stands of the *Salix planifolia/Carex scopulorum* community type were sampled on the Beartooth Plateau at elevations above ca. 9500 ft., all in wetlands supporting a mosaic of low willow shrub stands and *Carex scopulorum* wet meadows. Dominance of the shrub layer by *Salix planifolia* var. *monica* and dominance by *Carex scopulorum* in the herbaceous layer characterize stands of this community type.

Location and Environment

All samples of this type occurred in the Beartooth subsection in granitic alpine landscapes with an underlying geology of the Beartooth Mountains Formation.

This community type is a high-elevation type, occurring in subalpine wetlands with streams up to ca. 10 ft wide. Soils are saturated and may be wet at the surface. Adjacent vegetation types are *Carex scopulorum* wet meadows, *Deschampsia cespitosa* mesic meadows, and *Salix planifolia/Caltha leptosepala* stands.

Site Characteristics

Parent Material Granitic alluvium
Landform Glaciated trough bottom moderate valley
Plot Position Wide valley bottom
Elevation (ft.) 9,480 - 10,680
Precipitation (in.) 45-65

Vegetation Structure and Composition

The *Salix planifolia/Carex scopulorum* community type is characterized by a low (1 ft. to 3 ft. tall), often patchy shrub layer in which *Salix planifolia* var. *monica* is a major species. Other high-elevation willows (*Salix eastwoodiae*, *S. reticulata*) may also contribute substantial cover. The herbaceous understory is relatively poor in species, and is dominated by *Carex scopulorum*. *Carex rostrata*, *Deschampsia cespitosa*, *Caltha leptosepala*, and mosses may contribute substantial cover. Stands with sparse shrub layers grade into the *Carex scopulorum* herbaceous type.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
SHRUBS	45	10 - 80
Low	45	10 - 80
GRAMINOIDS	50	30 - 80
FORBS	8	1 - 20

Ground Cover

Percent cover of features on plot surface

	MEAN RANGE	
	%	%
Bare Soil	10	0 - 20
Gravel	1	0 - 2
Stones	0.5	0 - 1
Boulders	0.5	0 - 1
Litter & Duff	6	0 - 10
Wood (>1/4 in. diam.)	0.3	0 - 1
Moss & Lichen	43	1 - 80
Basal Vegetation	16	0 - 18
Water	21	2 - 40

Soils

GREAT GROUP: Typic Cryofibrists

PARTICLE SIZE CLASS: Fine loamy

AVERAGE COARSE FRAGMENTS: none

WATER TABLE AND MOTTLING DEPTH: Water table at or near the surface; mottling absent

ROOTING DEPTH: 28 inches of rooting zone

Succession/Management Implications

Girard *et al.* (1995) describe a *Salix planifolia/Carex* sp. from the Bighorn Mountains, and state that disturbance in stands of that type will lead to decrease in cover of the sedges and increases in *Deschampsia cespitosa* and *Poa pratensis*. That type may also be converted to woodlands as *Picea engelmannii* and *Pinus contorta* become established on hummocks. This information on succession may also apply to the *Salix planifolia/Carex scopulorum* community type described here.

Geographic Distribution & Other Studies

The *Salix planifolia/Carex scopulorum* habitat type is considered to be a major type of low to middle alpine regions of the White River and southwestern Arapaho National Forests of Colorado (Hess and Wasser 1982). Our stand resembles the vegetation from their habitat type, although our stand has more *Carex scopulorum*.



Figure 15 Tributary of Little Rock Creek, Beartooth Plateau, Clarks Fork Ranger District.

***Salix planifolia/Caltha leptosepala* Community Type
(Planeleaf willow/Marsh marigold Community Type)**

Number of Stands Sampled = 6

(145V95N026, 145V95N030, 145V95N042, 145V95N048, 141V93N036, 141V96N047)

General Description

On the Shoshone National Forest the *Salix planifolia/Caltha leptosepala* community type is found high in glacial valleys. It occurs on wet soils next to narrow channels or in depression. The vegetation consists of a shrub layer dominated by *Salix planifolia* and an understory dominated by forbs and graminoids common to wet soils, such as *Caltha leptosepala* and *Trollius laxus*.

Location and Environment

Two of the plots for this type occurred in the Beartooth subsection. Two plots occurred within the Southern Wind River subsection, on granitic moraine deposits. Another two plots were found in the Upper Wind River subsection on volcanic landslide deposits and the Wiggins Formation.

Stands of the *Salix planifolia/Caltha leptosepala* community type were sampled along Bonneville Creek at the inlet to Brook's Lake, at Bonneville Pass, along the South Fork of Warm Spring Creek and at nearby kettle ponds, and above Chain Lakes. Elevation of the sampled stands ranged from 9,060 ft. to 9,920 ft. The stands occupy wide strips along narrow stream channels, or large areas in valley bottoms or on adjacent hillslopes, or smaller areas surrounding kettle ponds. The areas are wet from late-melting snow patches. The ground surface generally slopes gently and is hummocky. Most of the stands have gravel, stones, cobbles, and boulders on the surface. Bare soil, litter, and usually moss are present.

Associated communities are *Carex aquatilis* meadows, *Deschampsia cespitosa* meadows, *Salix eastwoodiae/Carex aquatilis* stands, and sagebrush uplands.

Site Characteristics

Parent Material	Granitic, volcanic alluvium
Landform	Medium - wide valley bottoms
Plot Position	Floodplains, toeslopes
Elevation (ft.)	9,060 - 9,920
Precipitation (in.)	40-70

Vegetation Structure and Composition

Salix planifolia dominates or codominates the patchy shrub canopy, which may also contain substantial amounts of *Salix eastwoodiae* (often a codominant) or *Salix wolfii*, or both. The willows range from 1 ft. to 5 ft. tall. The dense herbaceous understory contains large amounts of forbs, especially *Caltha leptosepala*, *Trollius laxus*, *Antennaria corymbosa*, and *Aster foliaceus*. *Deschampsia cespitosa*, *Carex microptera*, and *Phleum alpinum* are the most common graminoids.

Community Structure

Percent canopy cover by life form and size class.

	MEAN RANGE	
	%	%
TREES	1	0 - 3
Saplings	1	0 - 3
SHRUBS	58	30 - 70
Low	38	20 - 70
Medium	25	0 - 60
GRAMINOIDS	35	20 - 50
FORBS	55	40 - 90

Ground Cover

Percent cover of features on plot surface.

	MEAN RANGE	
	%	%
Bare Soil	15	1 - 54
Gravel (2 mm - 3 in)	2	0 - 5
Stones (10 - 24 in)	3	0 - 7
Boulders (> 24 in)	7	0 - 27
Litter & Duff	29	8 - 72
Wood (> 1/4 in diam.)	2	0 - 10
Moss & Lichen	20	0 - 72
Basal Vegetation	12	10 - 12
Water	3	0 - 5



Figure 16 Kettle Ponds at Union Pass, Wind River Ranger District.

Soils

GREAT GROUPS: Typic Cryaquepts; Typic Cryaquolls; Histic Cryaquolls; Typic Cryaquents

PARTICLE SIZE CLASS: Fine loamy, Coarse loamy, Loamy skeletal

AVERAGE COARSE FRAGMENTS: Range from 0 to 21%

WATER TABLE AND MOTTLING DEPTH: Water table at or near the surface; mottling occurring at 0 to 6 inches

ROOTING DEPTH: 9 to 23 inches of rooting zone

Succession/Management Implications

The *Salix planifolia/Caltha leptosepala* community type occurs in swales or on gentle slopes that are saturated throughout the growing season. The soils are easily compacted by livestock. Overgrazing could open up the willow canopy, leading to increased evaporation. A lower water table could allow *Salix brachycarpa* or *Salix wolfii* to establish (Kittel and Lederer 1993).

Caltha leptosepala is found near seeps or in areas with a continual supply of fresh water (Padgett *et al.* 1989). It is unclear what factors lead to dominance of the understory by forbs (the *Salix planifolia/Caltha leptosepala* community type) or to dominance by sedges (the *Salix planifolia/Carex aquatilis* community type or the *S. planifolia/C. scopulorum* community type).

Geographic Distribution & Other Studies

The *Salix planifolia/Caltha leptosepala* community type has been described from the San Miguel/Dolores River Basin of Colorado (Kittel and Lederer 1993) and from the Routt National Forest (Kettler and McMullen 1996). The *Salix planifolia/Caltha leptosepala* habitat type is extensive at the higher elevations of White River Plateau in Colorado (Hess and Wasser 1982).

***Salix planifolia/Deschampsia cespitosa* Community Type
(Planeleaf willow/Tufted Hairgrass Community Type)**

Number of Stands Sampled = 1

(141V96N057)

General Description

The single stand sampled on the Forest is in the upper subalpine zone on the Beartooth Plateau.

Location and Environment

This sample occurred within the Beartooth subsection in subalpine to alpine cirque land. Parent material is from granitic moraine deposits.

This stand occupies a hummocky site on a terrace in a glacial cirque. A small stream meanders from a snowfield through the stand. Higher, drier slopes support *Salix glauca* vegetation, and lower, wetter sites support dense vegetation of tall forbs.

Site Characteristics

Parent Material	Granite alluvium
Landform	Moderate valley bottoms
Plot Position	Terrace
Elevation (ft.)	9980
Precipitation (in.)	65

Vegetation Structure and Composition

Salix planifolia var. *monica* strongly dominates a shrub layer ca. 1 ft. tall, and a small amount of *Salix glauca* is present. *Deschampsia cespitosa* and *Carex paysonis* dominate a relatively open understory, and mosses are thick on hummocks.

Community Structure

Percent canopy cover by life form and size class.

	MEAN
	%
SHRUBS	50
Low	50
GRAMINOIDS	30
FORBS	20

Ground Cover

Percent cover of features on plot surface.

	MEAN
	%
Bare Soil	15
Litter & Duff	30
Moss & Lichen	40
Basal Vegetation	15
Water	10

Soils

GREAT GROUP: Humic Cryaquept

PARTICLE SIZE CLASS: LOSK

AVERAGE COARSE FRAGMENTS: 65%

WATER TABLE AND MOTTLING DEPTH: Water table occurring at 14 inches; mottling absent

ROOTING DEPTH: 17 inches of rooting depth

Succession/Management Implications

Padgett *et al.* (1989) suggest that this is a stable vegetation type, probably not derived from the *S. planifolia/Carex aquatilis* type, where the composition of the vegetation is determined by the amount of grazing. Girard *et al.* (1995), though, postulate that this type is derived from their *S. planifolia/Carex* sp. ecological type, through a decline in the water table, and that heavy grazing will lead to a decrease in the cover of *Deschampsia* and an increase in species such as *Poa pratensis*.

Geographic Distribution & Other Studies

S. planifolia/D. cespitosa types similar to one another, and to our stand, have been described by Padgett *et al.* (1989) from the Uinta Mountains of northeastern Utah, the western slope of the Wind River Mountains in Wyoming by Potkin and Munn (1989), and from the Bighorn Mountains of Wyoming by Girard *et al.* (1995). Our stand appears to fall within the limits of the vegetation described from the *S. planifolia/Carex aquatilis* habitat type of Montana (Hansen *et al.* 1995).

***Salix candida*/*Carex rostrata* Community Type
(Hoary willow/Beaked sedge Community Type)**

Number of Stands Sampled = 1
(141V93N039)

General Description

On the Shoshone National Forest, one stand of the *Salix candida*/*Carex rostrata* community type was found on an anchored floating mat. The open shrub canopy of *Salix candida* and *Salix planifolia* grows above a wet herbaceous layer of *Carex rostrata* and *Carex aquatilis*.

Location and Environment

Sampled within the Beartooth subsection, this plot occurred in montane areas characterized by granitic till deposits within the Beartooth Mountains Formation.

The example of the *Salix candida*/*Carex rostrata* community type was found west of Lily Lake at an elevation of 7,700 ft. The stand occurred on an anchored organic mat near a small open lake that is gradually filling with sediments. Floating mats of *Carex rostrata* separate the occurrence from the open lake. Conditions are continually wet and anaerobic.

This community is adjacent to a *Carex rostrata* community, most of which is on a wet meadow with standing water, but part of which is on the floating vegetation mat. With increasing distance from the lake, the amount of *Salix candida* decreases and that of *Salix wolfii* increases, shifting the vegetation to a *Salix wolfii*/*Carex aquatilis* community.

Site Characteristics

Parent Material	Granitic alluvium
Landform	Lake bed deposit
Plot Position	Floating mat in lake
Elevation (ft.)	7,700
Precipitation (in.)	20

Vegetation Structure and Composition

Clumps of the short willows *Salix candida* and *Salix planifolia* are scattered on the fen surface. The herbaceous layer is codominated by *Carex rostrata* and *Carex aquatilis*. *Deschampsia cespitosa* and *Glyceria striata* are present in smaller amounts. The major forbs are *Aster foliaceus*, *Senecio streptanthifolius*, and *Gentianopsis detonsa*.

Community Structure

Percent canopy cover by life form and size class.

	MEAN
	%
SHRUBS	30
Low	30
GRAMINOIDS	50
FORBS	20

Ground Cover

Percent cover of features on plot surface.

	MEAN
	%
Bare Soil	2
Litter & Duff	45
Moss & Lichen	15
Basal Vegetation	10
Water	28

Soils

GREAT GROUPS: Typic Cryofibrists

PARTICLE SIZE CLASS: Fine loamy

AVERAGE COARSE FRAGMENTS: none

WATER TABLE AND MOTTLING DEPTH: Water table at or near the surface; mottling absent

ROOTING DEPTH: 35 inches of rooting zone

Succession/Management Implications

The *Salix candida*/*Carex rostrata* community type can be stable provided the water regime is constant (Chadde 1988). In Idaho, *Salix candida* occurs on quaking fens (Brunsfeld and Johnson, 1985). Heavy browsing can eliminate *Salix candida* and cause a change to a *Carex rostrata* or *Carex aquatilis* community (Hansen *et al.* 1991).

Geographic Distribution & Other Studies

Our stand is similar to the vegetation described from the *Salix candida*/*Carex rostrata* habitat type in the mid- elevation mountains of central and southwestern Montana (Hansen *et al.* 1991). *Salix candida* is present in part of the *Carex rostrata* vegetation type at Swamp Lake Botanical Area in the drainage of the Clarks Fork of the Yellowstone River (Fertig and Jones 1992), and that part of Swamp Lake may be an early stage of this community.



Figure 17 Fen east of Lily Lake, Clarks Fork Ranger District.

***Salix glauca* (Grayleaf willow) Vegetation**

Number of Stands Sampled = 1
(141V96N056)

General Description

One stand of vegetation dominated by *Salix glauca* was sampled on the Beartooth Plateau. The shrub layer contains some *Salix planifolia* var. *monica*. The herbaceous understory consists of scattered graminoids and forbs, with considerable moss cover.

Location and Environment

This type was sampled within the Beartooth subsection in areas characterized as subalpine to alpine cirque land. The parent material is derived from granitic moraine deposits.

This stand occupies a wide bench above a stream floodplain. A ridge encloses the bench on three sides, and snow apparently accumulates on the site. The adjacent vegetation in the riparian zone is a *Salix planifolia/Deschampsia cespitosa* stand, into which this *Salix glauca* stand merges. This type may best be considered transitional to the uplands, or an upland type of snowdrift areas, as indicated by Cooper and Lesica (1992) and Lesica (1993). Better examples of this community can be found by the Montana state line on the Beartooth Plateau.

Site Characteristics

Parent Material	Granitic alluvium
Landform	Cirque basin
Plot Position	Terrace
Elevation (ft.)	9,980
Precipitation (in.)	65

Vegetation Structure and Composition

Salix glauca forms a shrub layer ca. 2 ft. tall. *Salix planifolia* var. *monica* is present in the shrub layer, especially on the lower margin of the stand. Mosses growing on hummocks contribute the greatest cover to the herbaceous layer. The main vascular plants are *Calamagrostis canadensis* and *Mertensia ciliata*. Small amounts of other graminoids and forbs are present.

Community Structure

Percent canopy cover by life form and size class.

	MEAN
	%
SHRUBS	70
Low	70
GRAMINOIDS	20
FORBS	20

Ground Cover

Percent cover of features on plot surface.

	MEAN
	%
Bare Soil	3
Litter & Duff	50
Moss & Lichen	30
Basal Vegetation	17

Soils

(information not available)

Succession/Management Implications

We discovered no information on vegetation dynamics in *Salix glauca* vegetation and inferences could not be made from the limited data.

Geographic Distribution & Other Studies

Alpine and subalpine willow stands dominated by *Salix glauca* have been described from the Line Creek Plateau in Montana (Lesica 1993), Snowcrest and Gravelly Ranges in southwestern Montana (Cooper and Lesica 1992), and the western side of the Wind River Range in Wyoming (Potkin and Munn 1989). The vegetation from those studies differs from the vegetation in this stand, and no plant community type is apparent from the data.

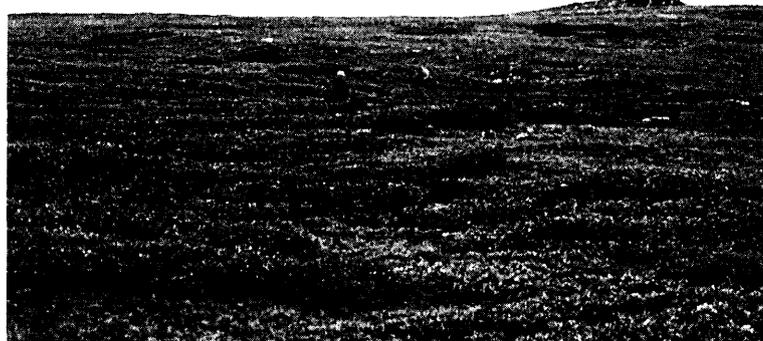


Figure 18 Beartooth Plateau, Clarks Fork Ranger District.

TALL WILLOW COMMUNITY TYPES

***Salix boothii* (Booth's willow) Series**

Tall willow stands dominated by *Salix boothii* occur throughout the study area and were sampled most frequently in the Wind River Ranger District, ranging in elevation from 6,660 ft. to 9,480 ft. *Salix boothii* is common on floodplain surfaces adjacent to the channel or set back ca. 20 ft, and ranging from 0.2 ft. to 3.8 ft. above the channel. It is also found infrequently in valley bottoms that are wet with seeps instead of distinct channels.

Salix boothii is the most abundant medium-height to tall willow of these plant community types, averaging 5 ft. tall but reaching 13 ft. tall in some stands. *Salix geeyeriana*, *S. drummondiana*, *S. lasiandra*, or *S. exigua* can also be present in substantial amounts. Stands are generally dense with medium to tall willows. In some community types a low willow species, such as *Salix wolfii*, growing beneath the tall willows may be equally or more abundant than the *Salix boothii*.

Salix boothii stands have been treated differently in different classifications. Hansen *et al.* (1995) in Montana include in their *S. geeyeriana* habitat type those stands with all combinations of *S. boothii* and *S. geeyeriana*, citing similarities between the two species in the environments they occupy and in management concerns. Padgett *et al.* (1989), on the other hand, place stands with at least 25% cover of *S. boothii* into their *S. boothii* community types, even if the stands have more cover of *S. geeyeriana*, because that much *S. boothii* cover significantly alters the structure of the vegetation.

A continuum of *Salix boothii* - dominated plant community types along a moisture gradient follows:
 wet ←————→ mesic ←————→ dry
 SALBOO/CARROS -> SALBOO/CARAQU -> SALBOO/Mesic grm ->SALBOO/CALCAN ->
 SALBOO/POAPRA or SALBOO/Mesic forb(and back to SALBOO/CARROS under wet conditions).



***Salix boothii*/*Carex rostrata* Community Type
(Booth’s willow/Beaked sedge Community Type)**

Number of Stands Sampled = 2
(145V95N003, 145V95N017)

General Description

On the Shoshone National Forest, the *Salix boothii*/*Carex rostrata* plant community type is found in valley bottoms near small channels and seeps on saturated soils. The community type has a dense, tall shrub layer dominated by *Salix boothii* with a herbaceous layer dominated by sedges, particularly *Carex rostrata*.

Location and Environment

One sample of this type occurred in the Wind River subsection on parent material derived from volcanic moraine deposits. The other sample was found within the Upper Wind River subsection where parent materials are influenced the Wind River Formation.

Stands of the *Salix boothii*/*Carex rostrata* plant community type were sampled near Charlie Creek and near Clint Creek, in valley bottoms next to multiple, small, moss-lined channels and on gently sloping seeps. Both stands were influenced by high water tables that saturate the soil surface. The plot surface is irregular with hummocks and saturated areas cut by channels of slowly-moving water.

Adjacent riparian communities are *Salix wolfii*/*Carex aquatilis* stands or stands of mixed *Salix geyeriana* and *Salix boothii*. An adjacent upland hillside contained a conifer—aspens stand.

Site Characteristics

Parent Material	Volcanic alluvium
Landform	Moderate valley bottoms
Plot Position	Floodplains and swales
Elevation (ft.)	7,800 to 8,385
Precipitation (in.)	20



Figure 19 Clint Creek, Wind River Ranger District

Vegetation Structure and Composition

Stands of the *Salix boothii*/*Carex rostrata* plant community type have a dense tall shrub layer averaging 4 ft. in height, with some shrubs reaching 6 ft. tall. This upper canopy is dominated by *Salix boothii*. Small amounts of *Salix drummondiana* can also be present in the canopy. A low shrub layer includes *Salix wolfii*, *Ribes inerme*, *Betula glandulosa*, *Lonicera involucrata* and *Pentaphylloides floribunda* (syn. *Potentilla fruticosa*).

The herbaceous layer is dominated by sedges, the most abundant of which is *Carex rostrata*. Also present in lower amounts are *Carex aquatilis*, *Carex microptera*, *Carex disperma* and *Juncus balticus*. Forbs are sparse to moderate and may include *Aster foliaceus*, *Epilobium angustifolium*, *Castilleja miniata*, and *Fragaria virginiana*. Substantial moss and litter cover the ground surface.

Community Structure

Percent canopy cover by life form and size class

	MEAN	RANGE
	%	%
TREES	2	0.5 - 3
Seedlings	0.3	0 - 0.5
Saplings	1.5	0 - 3
Pole	1.5	0 - 3
SHRUBS	85	80 - 90
Low	30	20 - 40
Medium	65	50 - 80
Tall	10	0 - 20
GRAMINOIDS	75	70 - 80
FORBS	25	10 - 40

Ground Cover

Percent cover of features on plot surface.

	MEAN	RANGE
	%	%
Bare Soil	5.5	5 - 6
Cobbles (3 - 10 in)	2.5	0 - 5
Stones (10 - 24 in)	1	0 - 2
Litter & Duff	29	27 - 30
Moss & Lichen	38	31 - 45
Basal Vegetation	12	11 - 13
Water	13	10 - 16

Soils

GREAT GROUPS: Typic Cryaquolls; Typic Cryofibrists

PARTICLE SIZE CLASS: Fine loamy, Loamy skeletal

AVERAGE COARSE FRAGMENTS: Range from 30 to 40%

WATER TABLE AND MOTTLING DEPTH: Water table at or near the surface; mottling occurring between 12 and 23 inches

ROOTING DEPTH: 12 to 23 inches of rooting zone

Succession/Management Implications

This plant community type may develop by changing from a community type with a mesophytic understory (Norton *et. al.* 1981) if the water level rises from, for example, construction of beaver ponds (Padgett *et. al.* 1989) because *Carex rostrata* and *Glyceria striata* are capable of establishing in standing water. As the site becomes drier the understory will be replaced by less hydrophilic species (Padgett *et. al.* 1989).

At our sites, animals using this community type include moose, elk, cattle and horses. Evidence of animal use at these occurrences included game trails, some browsing, and scat. Saturated soils of this community type are susceptible to compaction by large animals or heavy machinery (Padgett *et. al.* 1989).

Geographic Distribution & Other Studies

This plant community type is common throughout eastern Idaho and western Wyoming (Youngblood *et. al.* 1985); in the Wasatch mountains and Wasatch Plateau, Utah (Padgett *et. al.* 1989); in the Grey's River drainage, Wyoming (Norton *et. al.* 1981); and in the Yampa River drainage, Colorado (Kittel & Lederer 1993). In Montana, this type is included with stands of all combinations of *Salix geyeriana* and *Salix boothii* in which the understory is dominated by *Carex rostrata* (Hansen *et. al.* 1995). We described community types of both *Salix boothii*/*Carex rostrata* and *Salix geyeriana*/*Carex rostrata* because one of the two willows was consistently dominant.

***Salix boothii*/Mesic graminoid Community Type (Booth’s willow/Mesic graminoid Community Type**

Number of Stands Sampled = 7

(142V95N008, 145V95N036, 145V95N037, 145V95N038, 145V95N046, 141V93N029, 145V95N029)

General Description

The *Salix boothii*/Mesic graminoid community type can be found along small, meandering channels or beside medium-sized, braided channels. A dense, mixed-shrub layer dominated by *Salix boothii* and a dense herbaceous layer with a variety of grasses and sedges common to mesic environments characterize this *Salix boothii*/Mesic graminoid community type. There is no single graminoid or forb that dominates the herbaceous layer.

Location and Environment

Two samples, occurring within the Southern Wind River subsection were found on parent material derived from granitic moraine deposits and residuum. Two other samples occurred within the Upper Wind River subsection on volcanic alluvial deposits. One plot in the Absaroka subsection is characterized by volcanic alluvial deposits and the he Beartooth subsection on mixed alluvial deposit flood plains.

We sampled stands of *Salix boothii*/Mesic graminoid along the Wood River, the Wind River, Wiggins Creek, Clarks Fork of the Yellowstone River, Geyser Creek, and Little Warm Spring Creek, between elevations of 6,980 and 9,480 ft. These channels range from wide, low gradient, braided channels to narrow, moderate gradient, meandering channels. Stands occurred adjacent to the channel and ranged from ca. 100 ft. to 400 ft. wide. Along the smaller channels, the plant community type tends to occupy the width of the riparian zone, but next to the larger channels, it occurs within a small to large patch adjacent to the channel. The floodplain surfaces on which the community type occurred averaged 1.3 ft. above the bankfull channel height. The ground surface was usually irregular and contained little or no open water. There was usually substantial litter/duff at the surface, as well as small areas of bare soil.

These stands were usually next to upland coniferous vegetation. Adjacent riparian communities included *Salix geyeriana*/Mesic graminoid, and *Salix planifolia*/*Carex aquatilis* stands.

Site Characteristics

- Parent Material Volcanic, granitic alluvium
- Landform Wide - moderate valley bottoms
- Plot Position Floodplain, 1st terrace
- Elevation (ft.) 6,980 to 9,480
- Precipitation (in.) 15-35



Vegetation Structure and Composition

Figure 20 Geyser Creek, Wind River Ranger District.

In stands of the *Salix boothii*/Mesic graminoid community type, the mixed shrub layer is 2 ft. to 6 ft. tall and dense. *Salix boothii* is the most abundant willow, and *Salix geyeriana* or *S. drummondiana* may be present in smaller amounts. Shorter shrubs — *Salix planifolia*, *S. wolfii*, or *Pentaphylloides floribunda* (syn. *Potentilla fruticosa*) — were common to half of our stands. Scattered conifer seedlings or saplings can be present.

The herbaceous layer is dense in openings between the willow clumps. *Juncus balticus* was always present in our stands. Also common to stands of this community type is one or more mesic graminoids, including *Carex microptera*, *Deschampsia cespitosa*, *Carex aquatilis*, *Calamagrostis canadensis*, *C. norvegica*, *C. praticola*, and *C. lanuginosa*. Forbs contribute less cover than do graminoids. *Achillea millefolium* was present in small amounts at all our stands. Usually more abundant are *Aster* sp. and *Fragaria virginiana*.

Community Structure			Ground Cover		
Percent canopy cover by life form and size class.			Percent cover of features on plot surface.		
	MEAN	RANGE		MEAN	RANGE
	%	%		%	%
TREES	6	0 - 30	Bare Soil	28	0 - 65
Seedlings	3	0 - 20	Gravel (2 mm - 3 in)	2	0 - 10
Saplings	2	0 - 10	Cobbles (3 - 10 in)	2	0 - 8
Pole	1	0 - 3	Stones (10 - 24 in)	0.1	0 - 3
SHRUBS	63	50 - 90	Boulders (> 24 in)	0.1	0 - 3
Low	30	10 - 50	Litter & Duff	40	15 - 77
Medium	30	10 - 70	Wood (> 1/4 in diam.)	1	0 - 2
Tall	13	0 - 60	Moss & Lichen	13	0 - 40
GRAMINOIDS	49	30 - 70	Basal Vegetation	13	8 - 21
FORBS	37	30 - 50	Water	1	0 - 7

Soils

GREAT GROUPS: Typic Cryofluvents; Typic Cryaquepts; Typic Cryofluvents

PARTICLE SIZE CLASS: Loamy skeletal, Coarse loamy, Sandy Skeletal

AVERAGE COARSE FRAGMENTS: Range from 13 to 85%

WATER TABLE AND MOTTLING DEPTH: Water table at or near the surface; mottling occurring at the surface to 8 inches

ROOTING DEPTH: 9 to 27 inches of rooting zone

Succession/Management Implications

It seems that some of our stands of the *Salix boothii*/Mesic graminoid community type had previously belonged to other community types such as *Salix boothii*/*Carex aquatilis*, or *Salix boothii*/*Calamagrostis canadensis*. Alluvial deposition at these stands has caused them to become drier and this trend will likely continue (Padgett *et al.* 1989). Or, this plant community type may represent a grazing disclimax of the previous community types (Hansen *et al.* 1995). If this is the case, the dominance of *Salix boothii* rather than *Salix geyeriana* at our stands may support the hypothesis that *Salix geyeriana* is less tolerant than *Salix boothii* of grazing pressure (Hansen *et al.* 1995).

In the seven stands of the *Salix boothii*/Mesic graminoid plant community type that we sampled, browsing on the willows and grazing on the herbaceous layer was moderate, while browsing on the *Salix geyeriana* was sometimes heavy. Use of the area by moose, cow, deer, and horse was evident. Two stands of this community type (145V95N037 and 145V95N038) were next to each other; one (145V95N037) within a 10-foot tall enclosure and the other (145V95N038) outside the enclosure. The stand within the enclosure contained *Salix geyeriana* along with the *Salix boothii*. Outside the enclosure *Salix geyeriana* was absent, suggesting that grazing pressure is stronger on the *Salix geyeriana* than on the *Salix boothii*.

Geographic Distribution & Other Studies

The *Salix boothii*/Mesic graminoid type was first described from Utah and Idaho (Padgett *et al.* 1989). It also occurs in Montana (Hansen *et al.* 1995), where it is synonymous with the *Salix geyeriana* community type, which includes all combinations of *Salix geyeriana* and *Salix boothii*. The *Salix geyeriana* plant community type is a grazing disclimax (Hansen *et al.* 1995).

***Salix boothii*/Mesic forb Community Type
(Booth's willow/Mesic forb Community type)**

Number of Stands Sampled = 5
(145V95N018, 144V93N019, 142V95N001, 142V95N003, 141V96N027)

General Description

Stands of the *Salix boothii*/Mesic forb plant community type can be found in a variety of riparian settings on the Shoshone National Forest. This community type is composed of two to three shrub layers, with *Salix boothii* most abundant in the tall shrub layer. The herbaceous layer is composed of forbs common to mesic environments and a variety of grasses and sedges.

Location and Environment

The Bighorn Basin subsection was represented by two plots occurring in areas of river floodplains and terraces derived from volcanic parent materials. The Beartooth subsection is included by a sample on mixed sedimentary landscapes and landslide deposits in subalpine to alpine areas. In the Absaroka subsection one plot occurred on parent material developed from volcanic landslide deposits. Within the Upper Wind River subsection, a sample occurred in an area which is influenced primarily by the Wind River Formation.

Stands of the *Salix boothii*/Mesic forb plant community type were sampled along Wind River, Timber Creek, West Timber Creek and at the base of Carter Mountain between elevations of 7,460 and 8,050 ft. The riparian environments where we sampled this community type include a hillside seep; a small, meandering creek; a high gradient channel of moderate width just below the foothills; and a moderate gradient, single channel river. The community type is either adjacent to the channel or set back slightly and above a small bar community. The average height of the surface where this community type occurs is 2 ft. above the bankfull channel.

Surface topography usually is irregular with higher mounds at the willow patches. Much litter accumulates at the surface, with soil being more exposed at one stand. Riparian stands adjacent to the sampled *Salix boothii*/Mesic forb stands are *Populus tremuloides* woodlands or *Carex aquatilis* wet meadows. Adjacent upland communities are dominated by *Artemisia tridentata*, *Picea engelmannii*, and upland grasses.

Site Characteristics

Parent Material	Volcanic, sedimentary alluvium
Landform	Valley bottoms, landslide deposits
Plot Position	Floodplain, 1st terrace, toeslopes
Elevation (ft.)	7,460 - 9,020
Precipitation (in.)	15-50



Figure 21 Below Beartooth Butte, Clarks Fork Ranger District.

Vegetation Structure and Composition

Stands of the *Salix boothii*/Mesic forb community type are dominated by willows. *Salix boothii* is most abundant and ranges in height from 4 ft. to 13 ft. Other tall shrubs that may be present in smaller amounts are *Salix drummondiana*, *S. bebbiana*, and *Betula occidentalis*. Common medium-height and low shrubs include *Rosa* sp., *Ribes oxycanthoides*, *Pentaphylloides floribunda* (syn. *Potentilla fruticosa*), and *Betula glandulosa*.

Common to all of our stands were *Aster foliaceus*, *Fragaria virginiana*, and *Maianthemum stellatum*. Other mesic forbs often present are *Mertensia ciliata*, *Equisetum arvense*, and *Epilobium angustifolium*. Grasses and sedges are less abundant, and include *Juncus balticus*, *Calamagrostis canadensis*, *Carex microptera*, *Elymus trachycaulus*, and *Poa pratensis*.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
TREES	1.4	0 - 3
Seedlings	0.6	0 - 3
Saplings	0.8	0 - 3
Medium	0.6	0 - 3
SHRUBS	72	40 - 90
Low	16	0 - 40
Medium	38	10 - 90
Tall	32	0 - 70
GRAMINOIDS	34	10 - 60
FORBS	46	20 - 70

Ground Cover

Percent cover of features on plot surface.

	MEAN	RANGE
	%	%
Bare Soil	26	1 - 65
Litter & Duff	48	9 - 78
Wood (> 1/4 in diam.)	5	0 - 15
Basal Vegetation	12	5 - 16
Water	0.6	0 - 2

Soils

GREAT GROUPS: Mollic Cryofluvents; Typic Cryofluvents; Oxyaquic Cryofluvents

PARTICLE SIZE CLASS: Coarse loamy, Loamy skeletal

AVERAGE COARSE FRAGMENTS: Range from 0 TO 60%

WATER TABLE AND MOTTLING DEPTH: Water table at the surface to 32 inches; mottling occurring at the surface to 18 inches

ROOTING DEPTH: 12 to 22 inches of rooting zone

Succession/Management Implications

With excessive grazing, this community type will likely change towards the *Salix boothii*/*Poa pratensis* community type (Padgett *et al.* 1989). Evidence of animal use in stands of the *Salix boothii*/Mesic forb community type included elk tracks, moose scat, old beaver cut stumps, and browsed willows.

Geographic Distribution & Other Studies

The Shoshone National Forest stands of the *Salix boothii*/Mesic forb community type are similar to the Utah community of the same name (Padgett *et al.* 1989) and to the *Salix boothii*/*Smilacina stellata* of Idaho and Wyoming (Youngblood *et al.* 1985). In agreement with Padgett *et al.* (1985), we do not emphasize any single species in the herbaceous layer, because many forbs have high cover and constancy. The *Salix boothii*/*Mertensia ciliata* community type (Norton *et al.* 1981) also strongly resembles our community type. Stands of the *Salix boothii*/Mesic forb community type have also been described from Routt National Forest in Colorado (Kettler and McMullen 1996).

***Salix boothii*/*Salix wolfii* Type
(Booth's willow/Wolf's willow Type)**

Number of Stands Sampled = 4

(145V95N011, 145V95N027, 141V96N020, 145V95N001)

General Description

Salix boothii and *Salix wolfii* create the shrub layer in stands of this type. *Salix wolfii* is usually more abundant, but *Salix boothii* has a strong presence due to its height. This is probably a transitional type, which precludes finding consistent patterns of species composition in the understory; hence, we do not name this as a plant community type.

On the Shoshone National Forest, stands of the *Salix boothii*/*Salix wolfii* type were found on floodplains of small and medium channels. The sites are often affected by flooding or by grazing.

Location and Environment

One plot occurred within the Upper Wind River subsection in an area of volcanic landslide deposits. The Wind River subsection contains two samples in areas influenced by the Tepee Trail Formation. One other sample occurred within the Beartooth subsection, where they were influenced by the Gros Ventre and Flathead Formations.

Stands of the *Salix boothii*/*Salix wolfii* type were sampled along the East Fork of Wind River, Middle Long Creek, and Horse Creek between elevations of 7,780 ft. and 8,420 ft., and on the Beartooth Plateau near Clay Butte at 9,480 ft. These stands occur on meandering or braided channels ca. 7 ft. to 130 ft. wide, and from ca. 1 ft. to ca. 3 ft. above the bankfull channel height. The stands usually dominate the riparian zone. The ground surface may be level or undulating; and often the willows grow on hummocks. Litter cover is moderate.

Adjacent vegetation types in the riparian zone are forb meadows, fringes of *Salix drummondiana*-*Populus angustifolia* vegetation, and *Pentaphylloides floribunda* (syn. *Potentilla fruticosa*)/*Poa pratensis* stands. Nearby upland vegetation includes *Pentaphylloides floribunda* (*Potentilla fruticosa*) shrub stands, sagebrush shrub stands, or conifers.

Site Characteristics

Parent Material	Volcanic alluvium
Landform	Moderate - wide valley
Plot Position	Floodplain, terrace
Elevation (ft.)	7,780 - 9,480
Precipitation (in.)	20-45

Vegetation Structure and Composition

The occurrences of *Salix boothii*/*Salix wolfii* vegetation have a tall shrub layer (3 ft. to 5 ft. tall) of *Salix boothii* and a denser, low shrub (ca. 2 ft. tall) dominated by *Salix wolfii*. In the herbaceous layer, no species consistently contributes much cover, but several graminoids and forbs are usually present: *Deschampsia cespitosa*, *Carex praticola*, *Elymus trachycaulus*, *Achillea millefolium*, *Astragalus alpinus*, *Fragaria virginiana*, *Potentilla gracilis*, and *Taraxacum officinale*.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
TREES	1	0 - 3
Saplings	0.1	0 - 0.5
Pole	1	0 - 3
SHRUBS	72	60 - 90
Low	47	50 - 60
Medium	27	10 - 60
GRAMINOIDS	40	20 - 80
FORBS	53	40 - 60

Ground Cover

Percent cover of features on plot surface.

	MEAN	RANGE
	%	%
Bare Soil	23	5 - 70
Gravel (2 mm - 3 in)	5	0 - 15
Cobbles (3 - 10 in)	6	0 - 26
Stones (10 - 24 in)	2	0 - 7
Litter & Duff	33	15 - 80
Moss & Lichen	20	0 - 60
Basal Vegetation	14	10 - 20
Water	4	0 - 15

Soils

GREAT GROUPS: Typic Cryofluvents; Oxyaquic Cryofluvents; Typic Cryaquepts

PARTICLE SIZE CLASS: Coarse loamy, Loamy skeletal

AVERAGE COARSE FRAGMENTS: Range from 2 to 59%

WATER TABLE AND MOTTLING DEPTH: Water table at the surface to 14 inches; mottling occurring between 2 and 14 inches

ROOTING DEPTH: 9 to 26 inches of rooting zone

Succession/Management Implications

The *Salix boothii*/*Salix wolfii* type may be a transitional type, making the identification of consistent patterns of species composition in the understory difficult. *Salix boothii* is an obligate wetland species and *Salix wolfii* is a facultative species (Reed 1988, in Hansen *et al.* 1995). If the sites dry out, this vegetation type may shift toward a *Salix wolfii*/*Deschampsia cespitosa* plant community type.

Geographic Distribution & Other Studies

Two communities of the *Salix boothii*/*Salix wolfii* type have been described from the Bighorn National Forest in Wyoming (Girard *et al.* 1995). However, the understory vegetation of our stands is so dissimilar from stands in those types that we do not think our stands belong in either of the Bighorn types.



Figure 22 Horse Creek, Wind River Ranger District.

***Salix boothii* - *Salix farriae* Type
(Booth's willow - Farr's willow Type)**

Number of Stands Sampled = 2
(144V93N015, 141V93N035)

General Description

Salix farriae, a species of special concern and tracked by the Wyoming Natural Diversity Database (Fertig 1997), was rarely encountered on the Shoshone National Forest. At two locations, *Salix farriae* was associated with *Salix boothii*. Both stands contained mesic forb species, but one stand had few graminoids and the other stand was dominated by mesic graminoids in its understory. More data would be required to describe this community type.

Location and Environment

One sample was located within the Northern Absaroka subsection on parent material primarily derived from volcanic alluvium. Also sampled was a plot in the Beartooth subsection in an area characterized by mixed alluvial deposits.

Stands of *Salix boothii* -*Salix farriae* type were sampled along Middle Creek and along Clarks Fork of the Yellowstone River around 6,750 ft. elevation. These channels are 15 ft. to 20 ft. wide and 1.5 ft. to 2 ft. deep. At both sites, these mixed willow patches separate mixed conifer stands from the channel. These occurrences of *Salix boothii* -*Salix farriae* are adjacent to single channels on terraces 3 ft. above bankfull channel height. The patches are small, averaging 0.25 acre in area.

Site Characteristics

Parent Material	Volcanic, granitic alluvium
Landform	Moderate - wide valley bottoms
Plot Position	Terrace
Elevation (ft.)	6,660 - 6,840
Precipitation (in.)	15-20

Vegetation Structure and Composition

Stands of the *Salix boothii* - *Salix farriae* type are composed of various willow species and additional low shrubs. *Salix boothii* and *Salix farriae* are most abundant. Other willows present can include *Salix bebbiana*, *Salix drummondiana*, *Salix eastwoodiae*, *Salix exigua* or *Salix lasiandra*. At one stand the willows are mostly medium height; at the other stand they are mostly low stature. Non-willow shrubs that may be present are *Rosa sayi*, *Pentaphylloides floribunda* (syn *Potentilla fruticosa*) and *Alnus incana*. Conifers, primarily seedlings and saplings, are present in the stands. Some trees up to 35 ft. tall occur at the edge of one stand.

The herbaceous layer may be dominated by forbs or graminoids. The forbs *Maianthemum stellatum*, *Fragaria virginiana*, *Aster foliaceus* and *Cirsium scariosum* are always present in moderate amounts. The only grasses present in both stands are the introduced *Phleum pratense* and *Poa pratensis*. Present in large amounts at one stand were *Juncus balticus*, *Poa palustris* and *Bromus ciliatus*.

Community Structure

Percent canopy cover by life form and size class.

	MEAN RANGE	
	%	%
TREES	15	10 - 20
Seedlings	10	10
Saplings	5	0 - 10
Pole	5	0 - 10
Medium	10	0 - 20
SHRUBS	60	60
Low	27	3 - 50
Medium	45	30 - 60
Tall	2	0 - 3
GRAMINOIDS	35	20 - 50
FORBS	40	30 - 50

Ground Cover

Percent cover of features on plot surface.

	MEAN RANGE	
	%	%
Bare Soil	3	2 - 4
Litter & Duff	80	79 - 80
Wood (> 1/4 in diam.)	2	1 - 3
Moss & Lichen	3	1 - 4
Basal Vegetation	13	12 - 14

Soils

GREAT GROUPS: Fluvaquentic and Fluventic Cyroborolls

PARTICLE SIZE CLASS: Coarse loamy

AVERAGE COARSE FRAGMENTS: Range from 0 to 30%

WATER TABLE AND MOTTLING DEPTH: Water table at 16 to 24 inches; mottling occurring at 0 to 16 inches

ROOTING DEPTH: 22 to 24 inches of rooting zone

Succession/Management Implications

In Idaho, *Salix farriae* is known from the subalpine zone near stream edges and around seeps, and in openings in conifer forests (Brunsfield and Johnson 1985). Our sites on Shoshone National Forest were next to streams, but not especially wet. The willows in our stands of *Salix boothii* - *Salix farriae* were moderately to heavily browsed, which limited their height. Sign of moose and elk were present in these stands. Exotic grasses are found in both stands, especially *Poa pratensis* and *Phleum pratense*. *Trifolium hybridum*, an exotic clover, was abundant in one stand.

Geographic Distribution & Other Studies

Plant community types of the *Salix boothii* - *Salix farriae* type have not been identified elsewhere. More stands of this dominance type need to be sampled before plant community types are named.



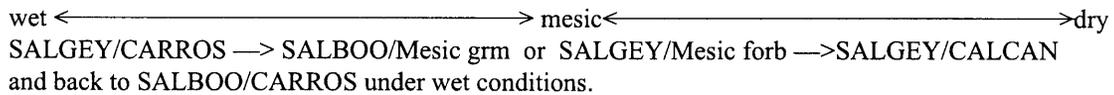
Figure 23 Middle Creek, Wapiti Ranger District.

***Salix geeyeriana* (Geyer's willow) Series**

Tall willow community types dominated by *Salix geeyeriana* occur throughout the study area and were sampled frequently in the Wind River District of the Shoshone National Forest. Sites sampled with *Salix geeyeriana*-dominated community types occurred at elevations ranging from 7,100 ft. to 8,390 ft. Stands of *Salix geeyeriana* are most common in wide valleys on floodplains, in mesic or wet environments. *Salix boothii* is commonly associated with *Salix geeyeriana* in these plant community types, but *S. geeyeriana* usually contributes ca. twice the cover of *S. boothii*. In most of the stands that we sampled, the willow are dense and tall. Indeed, the shrubs in the *Salix geeyeriana* stands are taller and denser than in the *Salix boothii* stands.

Salix geeyeriana and *S. boothii* stands have been treated differently in different classifications. Hansen *et al.* (1995) in Montana include in their *S. geeyeriana* habitat type those stands with all combinations of *S. geeyeriana* and *S. boothii*, citing similarities between the two species in the environments they occupy and in management concerns. Padgett *et al.* (1989), on the other hand, place stands with at least 25% cover of *S. boothii* into their *S. boothii* community types, even if the stands have more cover of *S. geeyeriana*, because that much *S. boothii* cover significantly alters the structure of the vegetation. That treatment is based on a narrower concept of the *S. geeyeriana* dominance type than that used by Youngblood *et al.* (1985) in western Wyoming and eastern Idaho, who considered all stands dominated by *S. geeyeriana* included in that dominance type, regardless of the amount of *S. boothii* present.

The composition of the understories in *Salix geeyeriana* - dominated community types depends on soil moisture. A continuum of Shoshone National Forest *Salix geeyeriana* - dominated communities along a moisture gradient is:



***Salix geyeriana/Carex rostrata* Community Type
(Geyer's willow/Beaked sedge Community Type)**

Number of Stands Sampled = 2
(142V95N004, 143V95N004)

General Description

On the Shoshone National Forest, stands of the *Salix geyeriana/Carex rostrata* plant community type dominate the riparian vegetation mosaics where they occur. The community type typically occupies one or both sides of the channel where the site is wet with areas of standing water. *Salix geyeriana* creates the upper shrub layer, with a canopy 6 ft. to 7 ft. tall. The herbaceous layer is dominated by *Carex rostrata*. Forbs contribute little cover.

Location and Environment

One sample of this type occurred within the Absaroka subsection on volcanic alluvial deposits. The other sample was found on mixed alluvial deposits within the Wind River Subsection.

Stands of the *Salix geyeriana/Carex rostrata* community type were the dominant communities of the large shrub wetland complexes along Dick Creek and Beaver Creek. Elevation at each sampling site was ca. 7,500 ft. Both channels are low gradient at the sites and quite sinuous. Beaver complexes help maintain the wet conditions necessary for this community type. The stands are large, occurring on one or both sides of the channel and ranging in width from ca. 130 ft. to ca. 1150 ft. At both sites, the *Salix geyeriana/Carex rostrata* community type occupies most of the riparian zone. Adjacent communities are drier. A spruce/willow stand was adjacent to one stand, and the other stand graded into a narrow band of less dense willow with a drier forb/graminoid understory away from the channel.

Both stands sampled were within large exclosures. The ground surface is rough, with mounds beneath the willows. Between mounds, the ground surface is very wet, often with standing or slowly-moving water. Litter and duff has accumulated on the mounds. Moss is found on the saturated soil between the mounds.

Site Characteristics

Parent Material	Volcanic, granitic alluvium
Landform	Moderate - wide valley bottoms
Plot Position	Floodplain, terrace
Elevation (ft.)	7,380 - 7,760
Precipitation (in.)	20 - 30

Vegetation Structure and Composition

The *Salix geyeriana/Carex rostrata* plant community type is a shrub wetland dominated by *Salix geyeriana* averaging 6.5 ft. tall, and sometimes as tall as 9 ft. *Salix boothii* was also present below the *Salix geyeriana* in small to moderate amounts. The shrub layer is made up of two layers of willows. Low *Pentaphylloides floribunda* (syn. *Potentilla fruticosa*) may form a shrub layer below the willows.

The herbaceous layer is dominated by graminoids, primarily dense *Carex rostrata*. Other important graminoids include *Calamagrostis canadensis* and *Poa palustris*. The graminoid layer is up to 2 ft. tall. Exotics were few but included *Poa pratensis*. A variety of forbs are present but each contributes little cover.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
SHRUBS	65	60 - 70
Low	10	0 - 20
Medium	40	30 - 50
Tall	25	10 - 40
GRAMINOIDS	80	80
FORBS	15	10 - 20

Ground Cover

Percent cover of features on plot surface

	MEAN	RANGE
	%	%
Bare Soil	5	0-10
Litter & Duff	34	21-48
Wood (>1/4 in diam.)	1	0-2
Moss & Lichen	1	0-1
Basal Vegetation	7	6-7
Water	33	15-50

Soils

GREAT GROUPS: Histic Cryaquents; Typic Cryaquolls

PARTICLE SIZE CLASS: Fine loamy, Coarse loamy

AVERAGE COARSE FRAGMENTS: Range 0 to 9%

WATER TABLE AND MOTTLING DEPTH: Water table at or near the surface; mottling occurring between 0 and 6 inches

ROOTING DEPTH: 14 to 24 inches of rooting zone

Succession/Management Implications

The *Salix geyeriana/Carex rostrata* plant community type occurs on a saturated surface where the water may have been ponded by beaver dams. Beavers were active at one of our sites. These flooded conditions are favorable for establishment of *Carex rostrata*. Under drier conditions, *Carex aquatilis* is more likely to colonize the understory. If existing stands of this community type dry out, *Calamagrostis canadensis* may come to dominate the understory, and the vegetation changes to the *Salix geyeriana/Calamagrostis canadensis* community type (Hansen *et al.* 1995). With heavy grazing and drier conditions, *Poa pratensis* will probably increase, perhaps leading to a *Salix geyeriana/Poa pratensis* community type.

Geographic Distribution & Other Studies

Our stands of *Salix geyeriana/Carex rostrata* are most similar to those described from northeastern Utah (Padgett *et al.* 1989). A broader *Salix geyeriana/Carex rostrata* community is described from eastern Idaho (Youngblood *et al.* 1985) and central Idaho (Mutz and Queiroz 1983) in which *Carex rostrata* or *Carex aquatilis* can dominate the herbaceous layer.



Figure 24 Beaver Creek at South Pass, Washakie Ranger District.

Salix geeyeriana/Mesic graminoid Community Type (Geyer's willow/Mesic graminoid Community Type)

Number of Stands Sampled = 6

(145V95N039, 142V95N007, 142V95N001, 145V95N008, 145V95N004, 145V95N010)

General Description

On the Shoshone National Forest, the *Salix geeyeriana*/Mesic graminoid community type is found on floodplains or terraces of braided channels in wide valleys in the Greybull and Wind River Ranger Districts. Stands contain a tall shrub layer of *Salix geeyeriana* with mixed medium-height and low shrubs. The herbaceous understory is dominated by grasses and sedges common to mesic environments. A variety of forbs are present, usually in small amounts.

Location and Environment

One sample occurred within the Absaroka subsection on parent material derived from volcanic alluvial deposits. Two samples occurred within the Upper Wind River subsection on parent material developed from volcanic alluvium influenced by the Wind River Formation. Two plots were located within the Wind River subsection where parent material is derived from volcanic and mixed alluvial deposits. One sample occurred within the Bighorn Basin subsection in areas characterized by volcanic alluvial floodplains and terraces.

Stands of the *Salix geeyeriana*/Mesic graminoid community type were sampled along the Wood River, the Wind River, Frontier Creek, and Charlie Creek between elevations of 7,620 ft. and 8,390 ft. These rivers are located in wide valleys and are generally ca. 50 ft. to 130 ft. wide, braided, and with moderate gradients. At one site the channel is narrow and meandering. The *Salix geeyeriana*/Mesic graminoid community type occurs on one or both sides of the channel, on the floodplains or terraces averaging 2 ft. above bankfull channel. It is usually separated from the channel by a lower surface. Patches of this community type are large and occupy much of the floodplain.

The ground surface in stands of the *Salix geeyeriana*/Mesic graminoid community type commonly is dry, has considerable litter, and varies from level to gently undulating to very hummocky.

The *Salix geeyeriana*/Mesic graminoid community type at one site grades into a similar, probably more disturbed, community with an understory dominated by *Cirsium scariosum*. It can also be found adjacent to a *Salix wolfii*/*Deschampsia cespitosa* stand, a *Salix boothii*/Mesic graminoid stand and a *Salix geeyeriana*/Mesic forb stand.

Site Characteristics

Parent Material	Volcanic alluvium
Landform	Wide valley bottoms
Plot Position	Terrace, floodplain
Elevation (ft.)	7,620 - 8,390
Precipitation (in.)	15-30



Figure 25 Wind River, Wind River Ranger District.

Vegetation Structure and Composition

Stands of the *Salix geeyeriana*/Mesic graminoid community type have an upper canopy dominated by 7 ft.-to-9 ft.-tall *Salix geeyeriana*. Beneath this upper canopy, the shrub layer is composed of two or three shorter shrubs, typically medium-tall *Salix boothii*, low *Salix wolfii*, and low *Pentaphylloides floribunda* (syn. *Potentilla fruticosa*). The six stands of the *Salix geeyeriana*/Mesic graminoid community type that we sampled are characterized by a dense layer of grasses and sedges common to mesic environments. These include *Carex praticola*, *C. microptera*,

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Juncus balticus, and *Deschampsia cespitosa*. The introduced *Poa pratensis* is also common to all the stands. A large variety of forbs is present, but they tend to contribute less canopy cover and have low constancy. Forbs present in most of the stands are *Fragaria virginiana*, *Aster foliaceus*, *Potentilla gracilis*, *Achillea millefolium*, and the exotic *Taraxacum officinale*. These forbs are common to most riparian communities.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
TREES	0.1	0 - 0.5
Seedlings	0.1	0 - 0.5
SHRUBS	62	0 - 90
Low	13	10 - 30
Medium	27	10 - 40
Tall	42	20 - 80
GRAMINOIDS	53	20 - 70
FORBS	42	30 - 70

Ground Cover

Percent cover of features on plot surface.

	MEAN	RANGE
	%	%
Bare Soil	12	0 - 28
Litter & Duff	66	49 - 82
Wood (> 1/4 in diam.)	3	0 - 7
Moss & Lichen	1	0 - 3
Basal Vegetation	15	8 - 28
Water	2	0 - 10

Soils

GREAT GROUPS: Typic Cryaquolls; Typic Cryofluvents

PARTICLE SIZE CLASS: Coarse loamy, Fine loamy, Loamy skeletal

AVERAGE COARSE FRAGMENTS: Range from 0 to 50%

WATER TABLE AND MOTTLING DEPTH: Water table at or near the surface to 12 inches; mottling occurring between 2 and 12 inches

ROOTING DEPTH: 11 to 26 inches of rooting zone

Succession/Management Implications

Stands of the *Salix geyeriana*/Mesic graminoid community type may have previously belonged to the *Salix geyeriana*/*Deschampsia cespitosa* community type. *Salix geyeriana* are generally tall but are cropped near the bases by browsing, creating open access for animals to pass through. The rich herbaceous layer is attractive to grazing animals. Grazing may have led to an increase of *Juncus balticus*, *Poa pratensis*, and *Carex praticola*. One of our stands of this community type (WIND33) is contained by an enclosure ca. 5 ft. tall. *Salix geyeriana* and *Salix boothii* are common within this enclosure and in a taller, adjacent enclosure. While outside both enclosures *Salix boothii* occurs without any *Salix geyeriana*. Moose and elk scat were found within the shorter enclosure of the *Salix geyeriana*/Mesic graminoid community type. Moose, deer, and cow scat were present outside the enclosures. It appears that grazing pressure is stronger on the *Salix geyeriana* than on the *Salix boothii*.

Geographic Distribution & Other Studies

The *Salix geyeriana*/Mesic graminoid community type is described from Utah and Idaho (Padgett *et al.* 1989) although *Salix boothii* was less important in their stands than in ours. This community type is similar to the *Salix geyeriana*/*Poa pratensis* community described for eastern Idaho (Youngblood *et al.* 1985). Our stands have high constancy of *Poa pratensis* as well as other mesic graminoids, leading us to agree with Padgett *et al.* (1989) in not emphasizing a single species as dominant in the understory.

***Salix geyeriana*/Mesic forb Community type
(Geyer's willow/Mesic forb Community type)**

Number of Stands Sampled = 1
(145V95N007)

General Description

The stand of the *Salix geyeriana*/Mesic forb community type sampled on the Shoshone National Forest is a young community found on the first surface of a braided, montane river. The occurrence is dominated by moderately-tall *Salix geyeriana*. The herbaceous layer has high species diversity, and is composed of many mesic forbs such as *Equisetum arvense* and *Pedicularis groenlandica*.

Location and Environment

This type was sampled within the Wind River subsection on volcanic alluvial deposits.

One stand of the *Salix geyeriana*/Mesic forb community type was sampled along Frontier Creek just above the confluence with Wiggins Fork at 8,085 ft. elevation in the Wind River Ranger District. The occurrence occupies ca. 0.7 acres on the first terrace adjacent to the braided river. The stand is found on a surface adjacent to the channel and 1.4 ft. above bankfull height. The ground surface of the occurrence is slightly undulating and is cut by a shallow, dry channel ca. 6 ft. wide. The soil surface is covered with moss, litter, gravel, and cobbles. Away from the channel, the *Salix geyeriana*/Mesic forb community type is adjacent to a sedge-dominated community on a terrace 10 ft. above the sampled stand.

Site Characteristics

Parent Material	Volcanic alluvium
Landform	Wide valley bottoms
Plot Position	Floodplain
Elevation (ft.)	8,085
Precipitation (in.)	30



Figure 26 Frontier Creek, Wind River Ranger District.

Vegetation Structure and Composition

In our stand, *Salix geyeriana* dominates a shrub layer less than 3 ft. tall, with a few shrubs reaching 5 ft. tall. The willows are vigorous but they have also been browsed. The shrub canopy also contains *Salix boothii* and *Pentaphylloides floribunda* (syn. *Potentilla fruticosa*). Scattered lodgepole pine seedlings, saplings, and one pole-size tree are present in the stand. The herbaceous layer is continuous and dominated by forbs, especially *Astragalus alpinus*, *Fragaria virginiana*, *Antennaria corymbosa*, *Aster foliaceus*, *Equisetum arvense*, and *Pedicularis groenlandica*. Most of these forbs favor mesic environments. The graminoid layer is less dense; *Carex microptera* is most abundant.

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Community Structure

Percent canopy cover by life form and size class.

	MEAN
	%
TREES	10
Seedlings	1
Saplings	3
Pole	3
SHRUBS	50
Low	20
Medium	30
Tall	10
GRAMINOIDS	30
FORBS	60

Ground Cover

Percent cover of features on plot surface.

	MEAN
	%
Bare Soil	10
Gravel (2 mm - 3 in)	7
Cobbles (3 - 10 in)	3
Litter & Duff	37
Wood (> 1/4 in diam.)	1
Moss & Lichen	35
Basal Vegetation	12

Soils

GREAT GROUP: Mollic Cryofluvents

PARTICLE SIZE CLASS: Loamy skeletal

AVERAGE COARSE FRAGMENTS: 50%

WATER TABLE AND MOTTLING DEPTH: Water table at 8 inches; mottling occurring 8 inches

ROOTING DEPTH: 12 inches of rooting zone

Succession/Management Implications

Our stand of the *Salix geyeriana*/Mesic forb community type is found on a rather young surface adjacent to the channel which experiences seasonal flooding. The shrub canopy of the *Salix geyeriana*/Mesic forb community type is rather open, allowing corridors for grazing animals. Some moose and cow scat was in the stand of the *Salix geyeriana*/Mesic forb community type. The willows showed evidence of being maintained at a shorter height from being browsed. With heavy grazing this community type may convert to a *Salix geyeriana* /*Poa pratensis* community (Padgett *et al.* 1989) which is more prone to bank sloughing because of the sparse roots of the dominant understory species.

Geographic Distribution & Other Studies

Our stand of the *Salix geyeriana*/Mesic forb community type is similar to those described from Utah (Padgett *et al.* 1989), eastern Idaho and western Wyoming (Youngblood *et al.* 1985), and the Routt National Forest, Colorado (Kettler 1996).

***Salix geyeriana/Calamagrostis canadensis* Community type
(Geyer's willow/Canada reedgrass Community type)**

Number of Stands Sampled = 1
(141V93N041)

General Description

We sampled one disturbed example of the *Salix geyeriana/Calamagrostis canadensis* community type on the Shoshone National Forest. Our stand is characterized by tall *Salix geyeriana* with a mix of other shrubs in the subcanopy. The herbaceous layer is composed of dense graminoids, primarily *Calamagrostis canadensis* and *Poa pratensis*.

Location and Environment

This sample occurred within the Northern Absaroka subsection on volcanic alluvial deposits.

One stand of the *Salix geyeriana/Calamagrostis canadensis* community type was sampled in the Clarks Fork Ranger District along Sunlight Creek at 7,100 ft. elevation. The occurrence was on a terrace 3 ft. above the braided river bed. The surface of the occurrence is covered with litter. The occurrence is adjacent to the channel or occasionally separated from it by a sand and cobble bar. Away from the river is a hillslope with upland vegetation.

Site Characteristics

Parent Material	Volcanic alluvium
Landform	Wide valley bottom
Plot Position	First terrace
Elevation (ft.)	7,100
Precipitation (in.)	20



Figure 27 Sulfur Camp on Sunlight Creek, Clarks Fork Ranger District.

Vegetation Structure and Composition

Salix geyeriana averaging 8 ft. tall dominates the stand of the *Salix geyeriana/Calamagrostis canadensis* community type. This willow provides 50% canopy cover. An intermediate-height shrub layer is dominated by *Salix boothii*, and a low shrub layer is created by a mixture of *Salix eastwoodiae*, *Ribes inerme*, and *Lonicera involucrata*. The herbaceous layer is primarily composed of a thick growth of grasses and sedges, the more important of which are *Calamagrostis canadensis*, *Poa pratensis*, *Carex microptera*, and *Deschampsia cespitosa*. Forbs are less abundant; *Senecio pauperculus* and *Aster foliaceus* are most common.

Our stand of the *Salix geyeriana/Calamagrostis canadensis* community type was approaching the *Salix geyeriana/Poa pratensis* type where *Calamagrostis canadensis* is still a major component of the herbaceous layer, but *Poa pratensis* has become very important. The only other introduced species is *Taraxacum officinale*, which contributes little cover.

Community Structure

Percent canopy cover by life form and size class.

	MEAN
	%
TREES	3
Seedlings	3
SHRUBS	50
Low	20
Medium	30
Tall	30
GRAMINOIDS	50
FORBS	30

Ground Cover

Percent cover of features on plot surface.

	MEAN
	%
Litter & Duff	82
Basal Vegetation	18

Soils

GREAT GROUPS: Fluventic Cryoborolls

PARTICLE SIZE CLASS: Coarse loamy

AVERAGE COARSE FRAGMENTS: 40%

WATER TABLE AND MOTTLING DEPTH: Water table at 17 inches; mottling occurring at 17 inches

ROOTING DEPTH: 17 inches of rooting zone

Succession/Management Implications

The stand that we sampled appears to be transitional between the *Salix geyeriana/Calamagrostis canadensis* type and the *Salix geyeriana/Poa pratensis* type. *Calamagrostis canadensis* and *Deschampsia cespitosa* are more palatable to grazing animals than is *Poa pratensis* (Hansen *et al.* 1995), and grazing probably has led to an increase of *Poa pratensis* and a decrease in the other grasses. Padgett *et al.* (1989) suggest that, over time, this community type may convert to a conifer/*Calamagrostis canadensis* community, if grazing pressure doesn't first shift it to a *Salix geyeriana/Poa pratensis* type.

Geographic Distribution & Other Studies

Salix geyeriana/Calamagrostis canadensis is an incidental community type of the Centennial Mountains, Idaho (Youngblood *et al.* 1985) and the Uinta Mountains, Utah (Padgett *et al.* 1989). It may be more common to north central Colorado in the Routt National Forest (Kettler 1996).

Other Tall Willow Dominance Types

Communities dominated by *Salix exigua* or *Salix drummondiana* are generally found next to stream channels or separated from the channels by narrow sedge or rush stands, generally on surfaces less than 4 ft. above bankfull channel height. Stands are also located on mid-channel bars. Most of the stands of these willow types are flooded seasonally.

On the Shoshone National Forest, three stands dominated by *Salix exigua* were sampled on the Clarks Fork and the Wapiti Ranger Districts. The understory was usually dominated by *Poa pratensis*. One stand dominated by *Salix drummondiana* and saplings of *Populus angustifolia* was sampled on the Wind River Ranger District. Three stands dominated or codominated by *S. lasiandra* were also sampled on the Forest, on the Wapiti Range District.

***Salix exigua/Poa pratensis* Community Type
(Coyote willow/Kentucky bluegrass Community Type)**

Number of Stands Sampled = 3

(144V93N001, 141V93N034, 141V93N042)

General Description

Stands of the *Salix exigua/Poa pratensis* community were located on the northern half of the Forest, on the Clarks Fork and the Wapiti Ranger Districts. *Salix exigua* or *S. melanopsis* dominate the overstories of these stands. The undergrowth is dense with graminoids and forbs. *Poa pratensis* is the most abundant species with the highest constancy. We refer to this type as a community rather than a community type because it fails to meet the criterion of being largely unaltered by human land use, as illustrated by the dominance of the herbaceous layer by introduced species.

Location and Environment

Two samples occurred within the Northern Absaroka subsection on volcanic alluvial deposits. A plot also occurred within the Beartooth subsection on river floodplains composed of mixed alluvial deposits.

On the Shoshone National Forest, stands of the *Salix exigua/Poa pratensis* community were sampled along the North Fork of the Shoshone River, Clarks Fork of the Yellowstone River, and Sunlight Creek. The rivers are large, high-order braided or wide, single, mountain channels. Elevation of the six sites ranged from 5,900 to 7,100 ft.

Our stands were usually adjacent to the active stream channel or to an overflow channel, from 0.2 ft. to 2 ft. above the bankfull channel. They may be separated from the channel by a narrow zone of *Salix exigua* seedlings colonizing a slightly lower surface. *Salix exigua* is the first shrub to colonize the gravel or cobble bars created by periodic flooding. The substrate becomes more sandy after the establishment of the vegetation, which traps the finer sediments when water flows over the surface. Away from the channel, the *Salix exigua/Poa pratensis* community can be adjacent to a *Populus angustifolia/Symphoricarpos occidentalis* stand, a wet meadow within an overflow area, a higher riparian surface with conifers and mixed shrubs, or a hillslope with upland vegetation.

Site Characteristics

Parent Material	Volcanic, granite, mixed alluvium
Landform	Wide valley bottoms
Plot Position	Terrace, bar
Elevation (ft.)	5,900 - 7,100
Precipitation (in.)	15-20

Vegetation Structure and Composition

Stands of the *Salix exigua/Poa pratensis* community have an overstory in which *Salix exigua* or *S. melanopsis* dominate. Seedlings and saplings of cottonwoods or conifers were often present. The herbaceous layer was dominated by graminoids, but forbs were usually abundant and diverse. Many of the common forbs and grasses are introduced species, indicating disturbance. *Poa pratensis* was present in all stands, almost always as the dominant grass. One stand had large amounts of the exotic sweet clovers, *Melilotus albus* and *Melilotus officinalis*. In the other stands, *Solidago canadensis* or *Solidago missouriensis* were present, and *Lupinus polyphyllus* was sometimes abundant.

Community Structure

Percent canopy cover by life form and size class.

	MEAN RANGE	
	%	%
TREES	7	0 - 10
Seedlings	4	0 - 10
Saplings	4	0 - 10
Pole	1	0 - 3
SHRUBS	33	30 - 40
Low	18	3 - 30
Medium	13	10 - 20
Tall	7	0 - 20
GRAMINOIDS	33	30 - 40
FORBS	27	20 - 30

Ground Cover

Percent cover of features on plot surface.

	MEAN RANGE	
	%	%
Bare Soil	33	2 - 45
Gravel (2 mm - 3 in)	5	0 - 15
Cobbles (3 - 10 in)	3	0 - 10
Litter & Duff	49	40 - 62
Wood (> 1/4 in diam.)	1	1
Basal Vegetation	9	8 - 10

Soils

GREAT GROUPS: Typic Cryofluvents and Typic Cryaquepts; Riverwash

PARTICLE SIZE CLASS: Coarse loamy, Sandy skeletal, Fine loamy, Loamy skeletal

AVERAGE COARSE FRAGMENTS: Range from 0 to 65%

WATER TABLE AND MOTTLING DEPTH: Water table at or near the surface to 12 inches ; mottling absent to occurring between 12 and 16 inches

ROOTING DEPTH: 10 to 25 inches of rooting zone

Succession/Management Implications

Salix exigua establishes readily on new, barren sediment bars subject to regular flooding. Without disturbance other than flooding, and if the soil surface stays moist, a *Salix exigua* bar community will develop the undergrowth of the *Salix exigua*/Mesic forb community type or the *Salix exigua*/Mesic graminoid community type. If the surface is disturbed or dries, the understory of the *Salix exigua*/*Poa pratensis* community is likely to develop, as in our stands. *Salix exigua* sprouts prolifically following release from heavy grazing pressure (Hansen *et al.* 1995). Willows in our stands were moderately to heavily browsed, and where the willows were heavily browsed, new stems were sprouting from the plant bases. The grasses and forbs were often grazed. Animal evidence included moose, cattle, elk, and rabbit.

Geographic Distribution & Other Studies

The *Salix exigua*/*Poa pratensis* community has been described from Utah and Wyoming (Youngblood *et al.* 1985; Padgett *et al.* 1989). It is similar to disturbed versions of other types described from Wyoming (Norton *et al.* 1981; Jones and Walford 1995), and from Colorado (Kittel and Lederer 1993). In Montana it is considered a disturbed or early-to mid-seral version of the *Salix exigua* community type (Hansen *et al.* 1995).



Figure 28 Sulfur Camp on Sunlight Creek, Clarks Fork Ranger District.

***Salix lasiandra* Community Type
(Pacific willow Community Type)**

Number of Stands Sampled = 3
(144V93N016, 144V93N022, 144V93N021)

General Description

This is a tall willow type from low elevations on the Forest. We sampled three stands on the Wapiti Ranger District in which *Salix lasiandra* dominates or codominates a tall shrub layer and the understories are dominated by one of several exotic grasses or forbs.

Location and Environment

Two samples occurred within the Northern Absaroka subsection on volcanic alluvium. One plot occurred within the Bighorn Basin subsection on river floodplain and terrace alluvium is composed volcanic materials.

Stands of this community type occur in moderate or wide valleys on alluvial terraces ca. 0.5 ft. to 2 ft. above the stream channel. The stands that we sampled were all lower than 6500 ft. elevation, and this community type apparently is a low-elevation type of the foothills. Nearby riparian types are *Salix exigua* shrubland and *Populus balsamifera* woodland.

Site Characteristics

Parent Material Volcanic alluvium
Landform Moderate to wide valley
Plot Position Terraces
Elevation (ft.) 5900 - 6440
Precipitation (in.) 15-20

Vegetation Structure and Composition

Salix lasiandra dominates a tall shrub layer, or codominates with *Salix lutea*. In one of our stands, *Salix melanopsis* contributed substantial cover and *Populus angustifolia* saplings, *P. balsamifera* saplings, and *Elaeagnus commutata* were present. In another stand, *Alnus incana* contributed substantial cover. The understories in all three of our stands were dominated by exotic grasses or forbs (primarily *Poa pratensis* and *Melilotus* sp.) and by *Poa palustris*.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
TREES	10	0 - 30
Seedlings	3	0 - 10
Saplings	7	0 - 20
SHRUBS	70	50 - 80
Low	8	3 - 10
Medium	13	10 - 20
Tall	57	40 - 70
GRAMINOIDS	67	60 - 70
FORBS	53	30 - 90

Ground Cover

Percent cover of features on plot surface.

	MEAN RANGE	
	%	%
Bare Soil	45	30 - 60
Gravel (2 mm - 3 in)	1	0 - 3
Cobbles (3 - 10 in)	1	0 - 2
Litter & Duff	41	28 - 50
Wood (> 1/4 in diam.)	1	1 - 2
Basal Vegetation	13	10 - 15
Water	0.3	0 - 1

Soils

GREAT GROUPS: Typic Cryofluvent; Typic Cryaquept

PARTICLE SIZE CLASS: FILO, COLO

AVERAGE COARSE FRAGMENTS: Range from 0-60%

WATER TABLE AND MOTTLING DEPTH: Water at surface to 16 inches; mottling occurring from 0 to 16 inches

ROOTING DEPTH: 10 to 25 inches of rooting depth

Succession & Management Implications

Salix lasiandra is a pioneer species that becomes established on newly-deposited sediments, and its habitat requirements are similar to those of *Salix exigua* and *Populus* sp. (Hansen *et al.* 1995).

Geographic Distribution & Other Studies

A *Salix lasiandra* community type has been named from low elevations in western and south-central Montana (Hansen *et al.* 1995) that resembles our stands from the Shoshone National Forest in species composition. The *S. lucida* var. *caudata* (syn. *S. lasiandra* var. *caudata*)/Mesic graminoid type named by Kettler and McMullen (1996) from the Routt National Forest of north-central Colorado has understories dominated by *Calamagrostis canadensis* and *Carex* sp., and less cover of exotic species. Kittel and Lederer (1993) have described a *Salix lasiandra*/Mesic graminoid plant community type from northwestern Colorado in which *S. ligulifolia* codominates or dominates the shrub layer, and the understory is dominated by exotic grasses. Padgett *et al.* (1989) group willow stands in Utah and southeastern Idaho dominated by *Salix lasiandra* into their *Salix exigua* communities.



Figure 29 North Fork Shoshone River near Wayfarers chapel, Wapiti Ranger District.

***Salix drummondiana* Series
(Drummond willow Series)**

Number of Stands Sampled = 1
(145V95N028)

General Description

On the Shoshone National Forest, we sampled one stand dominated by *Salix drummondiana* on a terrace next to a braided channel. The shrubs became established on a cobble bar, and the vegetation has trapped sand that now covers much of the soil surface. The vegetation is young, composed of low *Salix drummondiana*, saplings of *Populus angustifolia*, and some low *Salix boothii*. The herbaceous layer is sparse, with a variety of graminoids and forbs. We sampled too few stands to identify a *Salix drummondiana* plant community type.

Location and Environment

This plot occurred within the Wind River subsection on river alluvium influenced by the Tepee Trail Formation.

The *Salix drummondiana* stand was sampled adjacent to the East Fork of Wind River, a perennial, braided, mid-size montane channel in a wide valley. The stand grows on a sediment bar ca. 100 ft. wide and less than 1 ft. above the bankfull channel. Sand overlies cobbles at the surface, and some areas have exposed cobbles. The adjacent riparian vegetation farther from the channel is dominated by *Salix boothii* and *Salix wolfii*.

Site Characteristics

Parent Material	Volcanic alluvium
Landform	Wide valley bottoms
Plot Position	Terrace
Elevation (ft.)	8,420
Precipitation (in.)	20

Vegetation Structure and Composition

This stand has a dense shrub layer ca. 2 ft. high dominated by *Salix drummondiana* with lesser amounts of *S. boothii* and *Populus angustifolia* saplings. The herbaceous layer is sparse and composed of a mixture of graminoids and forbs (the former with slightly more cover), the most common of which are *Poa pratensis*, *Equisetum arvense*, and *Pedicularis groenlandica*.

Community Structure

Percent canopy cover by life form and size class.

	MEAN
	%
TREES	20
Seedlings	1
Saplings	20
SHRUBS	60
Low	60
Medium	3
GRAMINOIDS	30
FORBS	20

Ground Cover

Percent cover of features on plot surface.

	MEAN
	%
Bare Soil	57
Gravel (2 mm - 3 in)	20
Cobbles (3 - 10 in)	15
Wood (> 1/4 in diam.)	1
Moss & Lichen	3
Basal Vegetation	4



Figure 30 East Fork Wind River, Wind River Ranger District.

Soils

GREAT GROUP: Typic Cryofluvents

PARTICLE SIZE CLASS: Loamy skeletal

AVERAGE COARSE FRAGMENTS: 48%

WATER TABLE AND MOTTLING DEPTH: Water table at or near the surface; mottling occurring at 3 inches

ROOTING DEPTH: 5 inches of rooting zone

Succession/Management Implications

Our stand is early successional vegetation, having become established on a gravel bar. Apparently, *Populus angustifolia*, which typically establishes on gravel bars (McBride & Strahan 1984) became established on the gravel bars and trapped sand, in which *Salix drummondiana*, which typically establishes on finer-textured deposits [Brunsfeld & Johnson 1985) then became established. If the cottonwoods persists, the vegetation will become a cottonwood stand.

Hansen *et al.* (1995) describe *S. drummondii* stands with substantial *Poa pratensis* and *Equisetum arvense* as grazing disclimaxes of *S. drummondii*/*Calamagrostis canadensis* stands.

Evidence of moose and deer was present. Game trails and tracks were located within the stand.

Geographic Distribution & Other Studies

Other classifications have considered stands of mature *S. drummondii*, but a *Salix drummondiana* type with a large component of *Populus angustifolia* saplings has not been previously described. Youngblood *et al.* (1985) in western Wyoming and eastern Idaho, and Padgett *et al.* (1989) in southeastern Idaho and Utah, placed stands dominated by *S. drummondii* into the *S. boothii* dominance type because of structural similarities between the species. Hansen *et al.* (1995), on the other hand, recognize a *S. drummondiana* community type in Montana that our stand resembles.

RIPARIAN

NON-WILLOW SHRUB TYPES

***Betula occidentalis*/*Cornus sericea* Community Type
(Water birch/Red-osier dogwood Community Type)**

Number of Stands Sampled = 1
(141V93N040)

General Description

One stand of this type was sampled on the Forest — a dense mixture of tall shrubs with an equally dense lower shrub layer and a dense herbaceous understory, growing on the Dead Indian Creek floodplain.

Location and Environment

This sample occurred within the Beartooth Foothills subsection along a stream course influenced by mixed sedimentary and volcanic alluvium.

Our *Betula occidentalis* stand was sampled at 6,020 ft. elevation in the Clarks Fork Ranger District, on a terrace ca. 5 ft. above the stream channel.

Site Characteristics

Parent Material Mixed alluvium
Landform Moderately-wide valley
Plot Position Floodplain
Elevation (ft.) 6,020
Precipitation (in.) 15

Vegetation Structure and Composition

Scattered *Populus angustifolia* trees form a very sparse tree overstory. *Betula occidentalis* and *Alnus incana* codominate the tall shrub layer, which includes a minor amount of *Salix bebbiana*. A dense, lower shrub layer is dominated by *Cornus sericea* and contains minor amounts of *Ribes* and *Rosa*. The dense herbaceous layer is dominated by *Carex rostrata* and contains substantial amounts of other graminoids and forbs.

Community Structure

Percent canopy cover by life form and size class.

	MEAN
	%
TREES	10
Seedlings	3
Saplings	3
Pole	10
SHRUBS	60
Low	10
Medium	40
Tall	50
GRAMINOIDS	40
FORBS	30

Ground Cover

Percent cover of features on plot surface.

	MEAN
Litter & Duff	77
Wood (> 1/4 in diam.)	5
Basal Vegetation	18
Water	10

Soils

GREAT GROUP: Histic Cryaquept

PARTICLE SIZE CLASS: Fine loamy

AVERAGE COARSE FRAGMENTS: 45 %

WATER TABLE AND MOTTLING DEPTH: Water table at surface; mottling occurring at 5 inches

ROOTING DEPTH: 14 inches of rooting zone

Succession & Management Implications

Betula occidentalis stands may be seral to conifer woodlands or deciduous woodlands in Utah and southeastern Idaho (Padgett *et al.* 1989), Colorado (Kittel *et al.* 1994, Kittel *et al.* 1996), and Montana (Hansen *et al.* 1995). The successional status of stands in the Bighorn Mountains of Wyoming is unclear (Girard *et al.* 1995). The single stand that we sampled on the Shoshone National Forest shows no signs of becoming either a conifer woodland or deciduous woodland.

Geographic Distribution & Other Studies

Our single stand resembles most closely the *Betula occidentalis/Cornus sericea* community type described from Utah and southeastern Idaho (Padgett *et al.* 1989). *Betula occidentalis* types have also been described from the Bighorn Mountains of Wyoming (Girard *et al.* 1995), throughout Montana (Hansen *et al.* 1995), and central and north-central Colorado (Kittel *et al.* 1994, Kittel *et al.* 1996), but our stand differs from those types in containing a substantial amount of *Alnus incana* or a different set of dominant species in the herbaceous understory.

***Alnus incana/Equisetum arvense* Community Type
(Mountain alder/Field horsetail Community Type)**

Number of Stands Sampled = 1
(144V93N003)

General Description

We sampled one stand of this association on the Wapiti Ranger District. This is a tall shrub type in which *Alnus incana* dominates the tall shrub layer and the understory is a mixture of graminoids and forbs, with the former contributing slightly more cover.

Location and Environment

This sample occurred within the Northern Absaroka subsection on volcanic alluvium. Our stand occurred at 5980 ft. elevation, on a terrace less than 1 ft. above the stream channel.

Site Characteristics

Parent Material Volcanic alluvium
 Landform Moderately-wide valley bottom
 Plot Position Floodplain
 Elevation (ft.) 5,980
 Precipitation (in.) 15

Vegetation Structure and Composition

Alnus incana strongly dominates a dense, tall shrub layer that contains minor amounts of *Salix lutea* and *S. melanopsis*. Scattered lower shrubs are present. The herbaceous understory is strongly dominated by *Poa pratensis* and *Equisetum arvense*, and contains small amounts of numerous other graminoids and forbs.

Community Structure

Percent canopy cover by life form and size class.

	MEAN
	%
SHRUBS	40
Low	10
Medium	20
Tall	40
GRAMINOIDS	30
FORBS	30

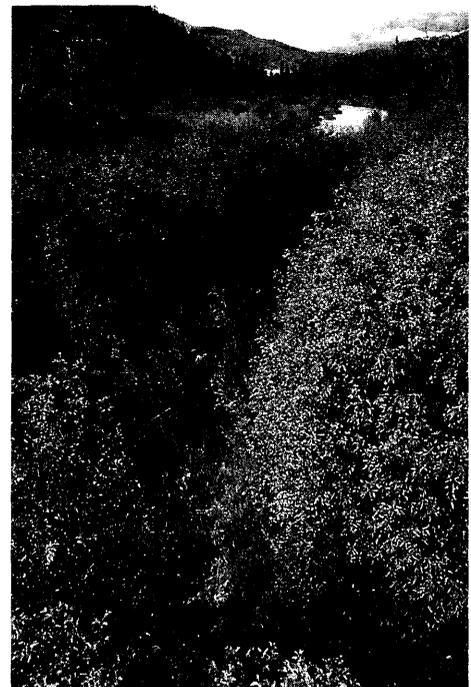


Figure 31 Elk Fork,
Wapiti Ranger District.

Ground Cover

Percent cover of features on plot surface.

	MEAN
Bare Soil	10
Stones (10 - 24 in)	2
Boulders (> 24 in)	3
Litter & Duff	50
Wood (> 1/4 in diam.)	3
Moss & Lichen	10
Basal Vegetation	22
Water	10

Soils

GREAT GROUP: Typic Cryofluvent

PARTICLE SIZE CLASS: Coarse loamy

AVERAGE COARSE FRAGMENTS: 75%

WATER TABLE AND MOTTLING DEPTH: Water table at surface; mottling occurring to surface

ROOTING DEPTH: 13 inches of rooting zone

Succession & Management Implications

Alnus incana often becomes established after a disturbance that creates open sites along the stream channel, and seems to survive on the site for a long time (Hansen *et al.* 1995). Eventually the alder may yield dominance of the overstory to other shrubs present in the stand. Alder stands may also be succeeded by conifer woodlands (Padgett *et al.* 1995).

Geographic Distribution & Other Studies

With the strong dominance of both *Poa pratensis* and *Equisetum arvense* in the herbaceous layer, our stand resembles two communities described from other studies: the *Alnus incana/Equisetum arvense* community type from the Routt National Forest of north-central Colorado (Kettler and McMullen 1996) and Utah (Padgett *et al.* 1989); and the *Alnus incana/Mesic* graminoid community from the Sierra Madre of south-central Wyoming (Jones 1992) and from central Colorado (Kittel *et al.* 1996). In Montana, Hansen *et al.* (1995) have described an *Alnus incana* community type in which heavy grazing may cause the understory to be dominated by exotics and unpalatable native species. In our case, this plot is influenced by an adjacent road where exotic species have been seeded along the right of way.

***Alnus incana*/Mesic graminoid Community Type
(Mountain alder/Mesic graminoid Community Type)**

Number of Stands Sampled = 2
(144V93N008, 141V93N010)

General Description

This is a streamside community with a tall shrub layer dominated by *Alnus incana*, a sparse layer of low shrubs, and a herbaceous understory rich in graminoids and forbs.

Location and Environment

These two plots occurred in the Northern Absaroka subsection on volcanic alluvium influenced by the Wapiti Formation.

Both of our stands were on the North Fork of the Shoshone River below 6,400 ft. elevation. One stand was in an abandoned meander ca. 6 ft. above active river channel, and the other on a stream bar ca. 1.5 ft. above the channel. The substrate beneath both stands was alluvium derived from volcanic rocks.

Site Characteristics

Parent Material	Volcanic alluvium
Landform	Wide valley bottom
Plot Position	Abandoned meander, stream bar
Elevation (ft.)	6,030 - 6,380
Precipitation (in.)	15

Vegetation Structure and Composition

In our stands, *Alnus incana* dominates a tall shrub layer that may be rather open or dense. *Salix bebbiana*, *S. exigua*, and *S. lasiandra* are present in smaller amounts. Lower shrubs (*Rosa* sp., *Rubus* sp., and *Ribes* sp.) are present in small amounts. The herbaceous layer is dominated by graminoids, (especially *Calamagrostis canadensis*, *Carex rostrata*, and *Glyceria grandis*), and contains many forbs, most in small amounts.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
TREES	1.5	0 - 3
Pole	1.5	0 - 3
SHRUBS	55	40 - 70
Low	0.5	0 - 1
Medium	20	1 - 20
Tall	55	40 - 70
GRAMINOIDS	45	30 - 60
FORBS	25	20 - 30

Ground Cover

Percent cover of features on plot surface.

	MEAN	RANGE
Bare Soil	20	0 - 40
Litter & Duff	53	35 - 70
Wood (> 1/4 in diam.)	3	1 - 5
Moss & Lichen	10	10 - 10
Basal Vegetation	16	15 - 17
Water	5	0 - 10

Soils

GREAT GROUPS: Mollic Cryofluvent; Histic Cryaquoll

PARTICLE SIZE CLASS: Organic and Fine loamy

AVERAGE COARSE FRAGMENTS: 0%

WATER TABLE AND MOTTLING DEPTH: Water table ranges from 0-13 inches; mottling occurring at 13 inches

ROOTING DEPTH: 14 inches of rooting zone

Succession & Management Implications

Padgett *et al.* (1989) suggest that this association is derived from an *Alnus incana*/Mesic forb type by grazing that decreases the cover of palatable forbs and increases the cover of graminoids.

Geographic Distribution & Other Studies

The vegetation of our stands resembles the *Alnus incana*/Mesic graminoid type described by Padgett *et al.* (1989) from Utah and southeastern Idaho, Jones (1992) from the Sierra Madre of south-central Wyoming, and Kettler and McMullen (1996) in the Routt National Forest of north-central Colorado. Kittel *et al.* (1996) have described an *Alnus incana*/Mesic graminoid association from the Arkansas River Basin of central Colorado with considerable *Cornus sericea* and *Betula occidentalis* in the shrub layer. Kittel *et al.* (1994) describe an *Alnus incana*/Mesic forb association that also resembles our stands in species composition, although their type has more cover of forbs than do our stands.



Figure 32 North Fork Shoshone River, Wapiti Ranger District

***Pentaphylloides floribunda*/*Poa pratensis* Community Type
(Shrubby cinquefoil/Kentucky bluegrass Community Type)**

Number of Stands Sampled = 2
(145V95N012, 141V93N025)

General Description

This is a low shrub vegetation type of drier riparian areas. *Pentaphylloides floribunda* and, frequently, *Artemisia cana* ssp. *viscidula* form a shrub layer above a herbaceous understory of numerous graminoids and forbs, of which *Poa pratensis*, *Festuca idahoensis*, *Antennaria microphylla*, and *Fragaria virginiana* contribute the most cover.

Location and Environment

One sample was located within the Beartooth subsection on montane granitic till landscapes. The other plot occurred within the Upper Wind River subsection on parent materials influenced by volcanic landslide deposits.

We sampled two stands of this vegetation type, one on the Beartooth Plateau and the other on a small stream in the Wind River Ranger District. The stands were ca. 2 ft. to ca. 4 ft. above the level of the bankfull channel. Nearby riparian vegetation (on lower surfaces) was *Salix boothii*-*Salix wolfii* vegetation at one site and *Salix wolfii*/*Carex aquatilis* vegetation at the other. Both stands adjoined upland vegetation on higher ground.

Site Characteristics

Parent Material Volcanics, granite slope alluvium
 Landform Moderate valleys bottoms
 Plot Position Toeslopes
 Elevation (ft.) 7,690 - 8,100
 Precipitation (in.) 20-25

Vegetation Structure and Composition

Pentaphylloides floribunda dominates a shrub layer ca. 2 ft. tall that may include a substantial amount of *Artemisia cana* ssp. *viscidula*. The herbaceous understory is a diverse mix of graminoids and forbs. *Festuca idahoensis*, *Poa pratensis*, *Antennaria rosea*, *Fragaria virginiana*, and *Geum triflorum* contribute substantial cover to both of our stands, and a number of other species contributed substantial cover in one stand.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
SHRUBS	55	50 - 60
Low	55	50 - 60
GRAMINOIDS	40	30 - 50
FORBS	40	40 - 40



Figure 33 Glacial till near Lily Lake, Clarks Fork Ranger District.

Ground Cover

Percent cover of features on plot surface.

	MEAN	RANGE
Bare Soil	32	10 - 53
Litter & Duff	54	36 - 72
Basal Vegetation	13	11 - 15

Soils

GREAT GROUPS: Typic Cryaquoll; Typic Cryoboroll

PARTICLE SIZE CLASS: Fine loamy

AVERAGE COARSE FRAGMENTS: 2 to 15 %

WATER TABLE AND MOTTLING DEPTH: Water table ranges from at the surface to 25 inches; mottling occurring at a range of 5 to 25 inches

ROOTING DEPTH: 16 to 22 inches of rooting zone

Succession & Management Implications

The presence of substantial amounts of *Poa pratensis* and *Fragaria virginiana* in the understory are interpreted by some investigators as evidence that this association includes stands originally belonging to a different *Pentaphylloides floribunda* association, but that have been substantially altered by grazing that decreased the cover of the more palatable native graminoids and increased the cover of exotics and less palatable natives (Youngblood *et al.* 1985; Padgett *et al.* 1989; Hansen *et al.* 1995). If this scenario is correct, then our stands represent degraded examples of the *Pentaphylloides floribunda/Festuca idahoensis* association.

Geographic Distribution & Other Studies

The *Pentaphylloides floribunda/Poa pratensis* association has been described under the name *Potentilla fruticosa/Poa pratensis* by Youngblood *et al.* (1985) in western Wyoming and eastern Idaho, Padgett *et al.* (1989) in Utah and southeastern Idaho, and Girard *et al.* (1995) in the Bighorn National Forest of Wyoming. Hansen *et al.* (1995) describe a *Potentilla fruticosa/Deschampsia cespitosa* habitat type in Montana, and Mattson (1984) a *Potentilla fruticosa/Festuca idahoensis* habitat type from the Yellowstone Plateau, that support vegetation like our stands. Earlier work on the Shoshone National Forest by Tweit and Houston (1980) also describe this type.



Figure 34 Beartooth Mountains, Clarks Fork Ranger District.



Figure 35 Sunlight Basin, Clarks Fork Ranger District.

HERBACEOUS TYPES



***Calamagrostis canadensis* Community Type
(Bluejoint Community Type)**

Number of Stands Sampled = 1
(145V95N022)

General Description

This type was sampled in a dense meadow on moist soils of floodplains and terraces. Shrubs and tree seedlings or saplings may be present indicating a possible transition to a coniferous riparian type such as *Picea/Calamagrostis canadensis* type.

Location and Environment

This sample occurred within the Southern Wind River subsection on granitic moraine deposits.

We sampled one stand of this type on a floodplain less than 1 ft. above the height of the bankfull channel. Nearby riparian vegetation belonged to the *Salix planifolia/Carex aquatilis* type and the *Carex aquatilis* type.

Site Characteristics

Parent Material Granitic alluvium
Landform Moderately wide valley bottom
Plot Position Floodplain
Elevation (ft.) 8900
Precipitation (in.) 25

Vegetation Structure and Composition

In our stand, *Calamagrostis canadensis* dominated a dense herbaceous layer ca. 3 ft. tall. Other common species were *Poa pratensis*, *Aster foliaceus*, *Equisetum arvense*, *Geum macrophyllum*, and *Taraxacum officinale*. *Pinus contorta* saplings and *Salix boothii* contribute substantial cover to a woody plant layer 2 ft. to 3 ft. tall.

Community Structure

Percent canopy cover by life form and size class.

	MEAN
TREES	3
Saplings	3
Pole	3
SHRUBS	30
Low	30
GRAMINOIDS	90
FORBS	30



Figure 36 Grandy Reservoir, Washakie Ranger District.

Ground Cover

Percent cover of features on plot surface.

	MEAN
Bare Soil	19
Litter & Duff	30
Wood (> 1/4 in diam.)	1
Basal Vegetation	10
Water	20

Soils

GREAT GROUP: Typic Cryaquoll

PARTICLE SIZE CLASS: Fine loamy

AVERAGE COARSE FRAGMENTS: 0%

WATER TABLE AND MOTTLING DEPTH: Water table at 22 inches; mottling occurring at 22 inches

ROOTING DEPTH: 22 inches of rooting depth

Succession & Management Implications

According to Hansen *et al.* (1995), repeated heavy grazing in meadows dominated by *Calamagrostis canadensis* will decrease the coverage of that species and other native grasses and sedges, and lead to dominance by *Juncus balticus* (on wetter sites) or *Poa pratensis* (on drier sites). Padgett *et al.* (1989), though, describe *C. canadensis* as being relatively unpalatable in Utah stands. They also state that this community type is becoming more widespread in Utah because mountain pine beetles are killing lodgepole pines, thereby reducing transpiration, which in turn causes an increase in the heights of water tables and the spread of *C. canadensis*. The data from the one stand that we sampled suggests that the opposite change may occur; the vegetation will change from *C. canadensis* meadow to *P. contorta* woodland as the pine saplings in the stand mature.

Geographic Distribution & Other Studies

This is a widespread and common type of vegetation, having been described from central Idaho (Mutz and Queiroz 1983), southeastern Idaho and Utah (Padgett *et al.* 1989), the west slope of the Wind River Mountains in Wyoming (Potkin and Munn 1989), the Bighorn National Forest of Wyoming (Girard *et al.* 1995), the Routt National Forest of north-central Colorado (Kettler and McMullen 1996), and the White and Colorado River Basins of central Colorado (Kittel *et al.* 1994). Hansen *et al.* (1995) described a widespread *Calamagrostis canadensis* habitat type in Montana that supports this vegetation type. The types described from these studies all have in common a dense herbaceous layer dominated by *Calamagrostis canadensis* and locations on sites with moist soils above the water table during much of the growing season. Associated species vary from study to study.

**Carex aquatilis Community Type
(Water Sedge Community Type)**

Number of Stands Sampled = 8

(145V95N014, 145V95N031, 145V95N024, 145V95N043, 144V93N018, 141V96N050, 141V96N052, 141V96N053)

General Description

Stands of this type are dense meadows dominated by *Carex aquatilis* growing in wet soils. Shrubs and tree seedlings or saplings may be present.

Location and Environment

Three plots were located within the Beartooth subsection. All are associated with alluvium influenced by granitic moraine deposits. Three plots occurred within the Upper Wind River subsection on parent materials influenced by the Wiggins Formation, volcanic landslide deposits, and the Aycross Formation. The Southern Wind River subsection included one plot influenced by granitic moraine deposits. One plot occurred within the Absaroka subsection on alluvium influenced by volcanic landslide deposits.

We sampled stands of this type on the Wind River, Wapiti, and Clarks Fork Ranger Districts. Seven of the eight stands were within 2 ft. of the height of the bankfull channel, and the eighth stand was ca. 4 ft. above the channel. Other vegetation types in the riparian zones with these stands were the *Salix planifolia/Carex aquatilis* community type, *S. planifolia/Caltha leptosepala* community type, *Salix eastwoodiae* type, *Salix wolfii/Poa pratensis* community type, *Carex scopulorum* community type, and *Calamagrostis canadensis* community type.

Site Characteristics

Parent Material	Granitic, volcanic alluvium
Landform	Moderate to wide valley bottoms
Plot Position	Floodplains and lakebed deposits
Elevation (ft.)	7980 - 9920
Precipitation (in.)	20-50



Vegetation Structure and Composition Figure 37 Carter Mountain Exclosure, Wapiti Ranger District.

Carex aquatilis dominates the herbaceous vegetation. The only other species that occurred in at least four of our eight stands were *Deschampsia cespitosa* and *Aster foliaceus*. *Carex canescens*, *C. microptera*, *C. praeceptorium*, *C. rostrata*, and *Deschampsia cespitosa* may contribute substantial cover in some stands. Moss covered at least 50% of the ground surface in two stands. *Salix planifolia* was present in small amounts in half of our stands.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
TREES	0.1	0 - 1
Seedlings	0.1	0 - 1
SHRUBS	7	0 - 30
Low	7	0 - 30
GRAMINOIDS	64	30 - 90
FORBS	13	0 - 30

Ground Cover

Percent cover of features on plot surface.

	MEAN	RANGE
	%	%
Bare Soil	7	0 - 18
Litter & Duff	36	0 - 78
Wood (> 1/4 in diam.)	0.1	0 - 1
Moss & Lichen	37	0 - 90
Basal Vegetation	10	5 - 15
Water	13	0 - 60

Soils

GREAT GROUPS: Histic Cryaquepts; Typic Cryofibrists; Typic Cryaquepts; Typic Cryaquept; Humic Cryaquepts

PARTICLE SIZE CLASS: Fine loamy to Coarse loamy

AVERAGE COARSE FRAGMENTS: 0 to 41 %

WATER TABLE AND MOTTLING DEPTH: Water table at surface; mottling occurring from 0 to 8 inches

ROOTING DEPTH: 21 to 24 inches of rooting zone

Succession & Management Implications

Sites where *Carex aquatilis* dominates seem to be inundated for shorter periods, or with shallower standing water, than are sites dominated by *C. rostrata*; and they are wetter than sites occupied by most other riparian types (Padgett *et al.* 1989). Hence if the site supporting *C. aquatilis* vegetation dries, shrubs (*Salix planifolia*, *S. wolfii*, *S. geyeriana*) may increase, forming a shrub type; or dominance may shift to another sedge or to *Deschampsia cespitosa*. Although the sites supporting *C. aquatilis* stands typically are wet enough to discourage heavy use by livestock, the species is palatable, and grazing may increase the abundance of hummocks (Padgett *et al.* 1989) and may decrease the cover of *C. aquatilis*, resulting in increases of less palatable and more grazing-resistant species such as *Juncus balticus*, *Poa pratensis*, *Carex nebraskensis*, *Taraxacum officinale*, and *Geum macrophyllum* (Hansen *et al.* 1995).

Geographic Distribution & Other Studies

Vegetation types dominated by *Carex aquatilis* are widespread and have been described in a number of studies. Our type seems equivalent to the *Carex aquatilis* community type of western Wyoming and eastern Idaho (Youngblood *et al.* 1985), the *C. aquatilis* community type of the western slope of the Wind River Range (Potkin and Munn 1989), the *C. aquatilis* ecological type of the Bighorn Range (Girard *et al.* 1995), and the *C. aquatilis* plant community type of the Routt National Forest of north-central Colorado (Kettler and McMullen 1996). The type we have described is somewhat less similar (in the amounts of secondary species) to the *C. aquatilis* community types described by Mutz and Queiroz (1983) from central Idaho and by Padgett *et al.* (1989) from southeastern Idaho and Utah. The single stand of *Carex aquatilis*-dominated vegetation described by Jones (1992) from the Sierra Madre of south-central Wyoming contains substantially more *Juncus balticus*. The *Carex aquatilis* plant community type described from the Yampa and San Miguel/Dolores River Basins of Colorado (Kittel and Lederer 1993) is dominated by *C. aquatilis* but contains a different set of secondary species. Kittel *et al.* (1994) describe a *C. aquatilis* - *C. utriculata* (synonymous with *C. rostrata*) type in central Colorado that includes stands like ours. In Montana, Hansen *et al.* (1995) have identified two phases of the *Carex aquatilis* habitat type with vegetation similar to our stands, and Mattson (1984) described habitat types in the *C. aquatilis* series from the Yellowstone Plateau that support vegetation similar to our stands.

***Carex limosa* Community Type
(Mud Sedge Community Type)**

Number of Stands Sampled = 1
(141V93N044)

General Description

This is a wet meadow type dominated or codominated by *Carex limosa*.

Location and Environment

This sample occurred within the Beartooth subsection in glacial scoured granitic upland landscape with numerous lakes.

We sampled one stand of this type on a floating vegetation mat below Beartooth Lake in the Beartooth Mountain Plateau. The substrate was saturated peat.

Site Characteristics

Parent Material	Granitic alluvium, peat
Landform	Lakebed deposit
Plot Position	Floating mat
Elevation (ft.)	8980
Precipitation (in.)	45

Vegetation Structure and Composition

In our stand, *Carex limosa* and *C. aquatilis* strongly dominate the vegetation of the floating mat. Two forbs of wet habitats — *Menyanthes trifoliata* and *Pedicularis groenlandica* — are present in substantial amounts.

Community Structure

Percent canopy cover by life form and size class.

	MEAN
	%
SHRUBS	10
Low	10
GRAMINOIDS	40
FORBS	20

Ground Cover

Percent cover of features on plot surface.

	MEAN
Bare Soil	10
Litter & Duff	20
Moss & Lichen	50
Basal Vegetation	10
Water	10

Soils

GREAT GROUP: Typic Cryofibrists

PARTICLE SIZE CLASS: Fine loamy

AVERAGE COARSE FRAGMENTS: 0%

WATER TABLE AND MOTTLING DEPTH: Water table at surface; mottling occurring from surface

ROOTING DEPTH: 15 inches of rooting zone

Succession & Management Implications

Padgett *et al.* (1989) describe this as a stable type on saturated, undecomposed organic material. They postulate that drying of the site and consequent decomposition of the substrate could lead to dominance of the vegetation by *Carex aquatilis*.

Geographic Distribution & Other Studies

Our stand closely resembles the *Carex limosa* community type described by Padgett *et al.* (1989) from the Uinta Mountains of northeastern Utah, and the vegetation of the *C. limosa* - *C. aquatilis* habitat type of Mattson (1984) from the Yellowstone Plateau. Hansen *et al.* (1995) have named a *C. limosa* habitat type from the mountains of Montana, the vegetation and environment of which also resemble our stand.



Figure 38 Floating mat near Beartooth Lake, Clarks Fork Ranger District

***Carex rostrata* Community Type
(Beaked Sedge Community Type)**

Number of Stands Sampled = 9

(142V95N006, 145V95N006, 141V93N027, 141V93N030, 145V95N025, 144V93N006, 141V93N045, 141V96N058, 141V93N032)

General Description

Stands of this type are dense, wet meadows growing on the edges of stream channels, on lake margins, and on other saturated sites. The vegetation is dominated or codominated by *Carex rostrata*. Tree seedlings or saplings and shrubs may be present in small amounts.

Location and Environment

Five of the plots occurred within the Beartooth subsection on alluvial parent materials developed from mixed moraine material. Other subsections included are the Wind River, Absaroka, Northern Absaroka, and the Southern Wind River influenced by volcanic alluvium, volcanic landslide deposits, and granitic moraine deposits.

We sampled nine stands of this type on the Clarks Fork, Wind River, Wapiti, and Greybull Ranger Districts, along streams, around lakes, and on kettle topography. All of the stands were on wet or saturated soils, and the stands along streams were less than 0.5 ft. above the height of the bankfull channel. Other riparian vegetation types present at the sites were *Salix wolfii* shrub stands, *S. eastwoodiae* shrub stands, *S. boothii* shrub stands, *S. geeyeriana* shrub stands, *S. planifolia* shrub stands, *Pentaphylloides floribunda* shrub stands, and *Carex limosa* meadows.

Site Characteristics

Parent Material	Mixed alluvium
Landform	Moderate to wide valley bottoms
Plot Position	Floodplains, terraces, lakebeds
Elevation (ft.)	6100 - 9210
Precipitation (in.)	15-45



Vegetation Structure and Composition

Figure 39 Union Pass, Wind River Ranger District.

Carex rostrata or, rarely, *C. vesicaria* dominate the vegetation. Other herbaceous species that may be present in more than trace amounts are *C. aquatilis* (which may codominate), *C. atherodes*, *C. simulata*, and *Deschampsia cespitosa*. Shrubs and spruce saplings or seedlings may be present, but the vegetation is obviously herbaceous meadow.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
TREES	1	0 - 10
Saplings	1	0 - 10
SHRUBS	6	0 - 20
Low	4	0 - 20
Medium	0.3	0 - 3
Tall	1	0 - 10
GRAMINOIDS	66	40 - 90
FORBS	6	0 - 20

Ground Cover

Percent cover of features on plot surface.

	MEAN	RANGE
Bare Soil	13	0 - 80
Boulders (> 24 in)	0.2	0 - 2
Litter & Duff	26	0 - 65
Wood (> 1/4 in diam.)	0.1	0 - 1
Moss & Lichen	8	0 - 40
Basal Vegetation	12	5 - 20

Soils

GREAT GROUPS: Typic Cryaquolls; Typic Cryofibrists; Histic Cryofibrists; Histic Cryaquolls

PARTICLE SIZE CLASS: Fine loamy to loamy skeletal

AVERAGE COARSE FRAGMENTS: 0 to 30 %

WATER TABLE AND MOTTLING DEPTH: Water table at surface; mottling occurring from 0 to 24 inches

ROOTING DEPTH: 10 to 24 inches of rooting zone

Succession & Management Implications

Carex rostrata establishes on mineral substrates, and therefore is a pioneer species on sites such as drained beaver ponds (Padgett *et al.* 1989, Hansen *et al.* 1995). The species also tolerates deeper standing water than does *C. aquatilis*, although the dominance of a site by either *C. rostrata* or *C. aquatilis* may depend more on which species first occupies the site than on differences between the two in habitat preferences (Padgett *et al.* 1995). The effects of grazing on *C. rostrata* stands are unclear; Padgett *et al.* (1989) state that the species is less palatable, at least seasonally, than are *C. aquatilis* or *C. nebraskensis*, but Hansen *et al.* (1995) state that heavy grazing can decrease the cover of *C. rostrata* and increase the cover of *C. nebraskensis* and other species. In either case, sites supporting *C. rostrata* vegetation are wet enough that grazing animals probably avoid them.

Geographic Distribution & Other Studies

Vegetation dominated by *Carex rostrata* has been described from a number of studies. Our approach in including stands with substantial amounts of *C. aquatilis*, *Deschampsia cespitosa*, or other species follows the concept of this vegetation type used by Youngblood *et al.* (1985) in western Wyoming and eastern Idaho, Padgett *et al.* (1989) in southeastern Idaho and Utah, Mutz and Queiroz (1983) in central Idaho, Potkin and Munn (1989) on the western slope of Wyoming's Wind River Mountains, Jones (1992) in the Medicine Bow National Forest of south-central Wyoming, Kittel *et al.* (1994) and Kittel *et al.* (1996) in central Colorado (both studies using the name *Carex utriculata* rather than *C. rostrata*), and Kittel and Lederer (1993) in west-central Colorado. This concept of the *C. rostrata* type includes two *C. rostrata* community types and two *C. rostrata* ecological types named from the Bighorn National Forest by Girard *et al.* (1995). It also corresponds to the *C. rostrata* - *C. rostrata* habitat type described from the Yellowstone Plateau by Mattson (1984), and three phases of the *C. rostrata* habitat type from Montana (Hansen *et al.* 1995).

***Carex scopulorum* Community Type
(Mountain Sedge Community Type)**

Number of Stands Sampled = 3
(141V96N016, 141V96N046, 141V96N051)

General Description

This is a high-elevation, herbaceous meadow type of wet sites below snowbanks and near stream channels.

Location and Environment

These plots occurred within the Beartooth subsection within granitic alpine landscapes on parent material is developed from the Beartooth Mountain Formation and granitic moraine deposits.

We sampled three stands of this type, all on the Beartooth Plateau in the Clarks Fork Ranger District. The stands occurred on sites with standing water, in wetlands that included *Salix planifolia*/*Carex scopulorum* stands and *Carex aquatilis* stands.

Site Characteristics

Parent Material	Granitic residuum and till
Landform	Alpine plateau
Plot Position	Upper slopes
Elevation (ft.)	9,740 - 10,600
Precipitation (in.)	45-65

Vegetation Structure and Composition

Carex scopulorum is present in substantial amounts and may dominate the vegetation. *Caltha leptosepala* had high cover values in two of our stands, and at least one of our stands contained substantial amounts of *Carex illota*, *Deschampsia cespitosa*, *Juncus mertensianus*, *Senecio cymbalarioides*, and mosses. *Salix planifolia* was present in all three stands and formed a scattered shrub layer in two. This type merges with stands of the *S. planifolia*/*C. scopulorum* community type as the shrub layer becomes denser.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
SHRUBS	8	3 - 10
Low	8	3 - 10
GRAMINOIDS	47	30 - 70
FORBS	23	10 - 40

Ground Cover

Percent cover of features on plot surface.

	MEAN	RANGE
Bare Soil	15	0 - 25
Gravel (2 mm - 3 in)	1	0 - 3
Litter & Duff	17	0 - 50
Moss & Lichen	27	0 - 70
Basal Vegetation	13	10 - 15
Water	8	0 - 30

Soils

GREAT GROUPS: Histic Cryaquoll; Humic Cryaquept

PARTICLE SIZE CLASS: Fine loamy

AVERAGE COARSE FRAGMENTS: 6 %

WATER TABLE AND MOTTLING DEPTH: Water table at surface to 9 inches; mottles absent

ROOTING DEPTH: 24 inches of rooting zone

Succession & Management Implications

According to Hansen *et al.* (1995), moderate grazing and trampling in stands of this type will increase the cover of forbs, while heavy grazing will decrease the cover of *C. scopulorum* and increase the cover of less palatable species such as *Juncus balticus* and *Poa pratensis*. The saturated soils that support this community type are susceptible to compaction.

Geographic Distribution & Other Studies

This is a widespread type, having been described from the west slope of the Wind River Range by Potkin and Munn (1989), the Routt National Forest of north-central Colorado by Kettler and McMullen (1996), west-central Colorado by Kittel *et al.* (1994), and southwestern Montana by Cooper and Lesica (1992). Hansen *et al.* (1995) described a *C. scopulorum* habitat type in Montana that supports vegetation of this community type.



Figure 40 Beartooth Mountains, Clarks Fork Ranger District.

***Carex simulata* Community Type
(Analogue Sedge Community Type)**

Number of Stands Sampled = 1
(145V95N016)

General Description

This is a sedge meadow of wet sites at medium to high elevations.

Location and Environment

This type was sampled within the Upper Wind River subsection on parent materials influenced by the Wind River Formation.

We sampled one stand of this type in the Wind River Ranger District, in a wet meadow with saturated organic substrate. Other riparian types present at the site were the *Salix boothii*/*Carex rostrata* community type and the *S. wolfii*/*C. aquatilis* community type.

Site Characteristics

Parent Material	Volcanics alluvium
Landform	Narrow valley bottom
Plot Position	Floodplain
Elevation (ft.)	7,820
Precipitation (in.)	20

Vegetation Structure and Composition

The depauperate vegetation of our stand was strongly dominated by *Carex simulata*. *C. aquatilis* and *C. rostrata* were the only other species present in more than trace amounts.

Community Structure

Percent canopy cover by life form and size class.

	MEAN
	%
SHRUBS	3
Low	3
GRAMINOIDS	90
FORBS	1

Ground Cover

Percent cover of features on plot surface.

	MEAN
Bare Soil	3
Litter & Duff	27
Moss & Lichen	50
Basal Vegetation	10
Water	10

Soils

GREAT GROUP: Typic Cryofibrists

PARTICLE SIZE CLASS: Fine loamy

AVERAGE COARSE FRAGMENTS: 0 %

WATER TABLE AND MOTTLING DEPTH: Water table at surface; mottling occurring from surface

ROOTING DEPTH: 15 inches of rooting depth

Succession & Management Implications

The year-round high water tables in sites supporting this type apparently discourage grazing animals, and the stands on organic substrates are stable in composition (Padgett *et al.* 1989; Hansen *et al.* 1995). Padgett *et al.* (1989) report that stands on mineral soils usually show signs of grazing, but they do not describe the effects of that grazing.

Geographic Distribution & Other Studies

This community type has been described from western Wyoming and eastern Idaho (Youngblood *et al.* 1985), central Idaho (Mutz and Queiroz 1983), and southeastern Idaho and Utah (Padgett *et al.* 1989). Hansen *et al.* (1995) describe a *C. simulata* habitat type from Montana that supports this vegetation type.



Figure 41 Clint Creek, Wind River Ranger District

**Deschampsia cespitosa Community Type
(Tufted Hairgrass Community Type)**

Number of Stands Sampled = 6

(145V95N009, 145V95N021, 145V95N032, 141V93N038, 141V96N048, 141V96N049)

General Description

This is a herbaceous meadow of well-drained, mesic sites over a broad range in elevation. Stands vary in species composition, but *Deschampsia cespitosa* always is a dominant or codominant species, with plants in wet habitats contributing noticeably less cover than do plants of mesic habitats.

Location and Environment

Three of the samples occurred within the Beartooth subsection within areas of subalpine and alpine meadows influenced by alluvium developed from granitic moraine deposits and residuum. Two plots occurred within the Upper Wind River subsection on parent materials influenced by the Wind River Formation, and the Wiggins Formation. One plot occurred within the Wind River subsection on parent material influenced by Bighorn Dolomite.

We sampled six stands on the Shoshone National Forest that we are placing into this type. The stands ranged in height above the bankfull stream channel from less than 1 ft. to ca. 8 ft. Other riparian vegetation types at the sites included *Carex aquatilis* wet meadow, *Salix geyeriana*/Mesic graminoid shrub type, *S. wolfii*/*Carex aquatilis* shrub type, several *S. planifolia* types, and *S. eastwoodiae*-*S. planifolia* shrub type.

Site Characteristics

- Parent Material Volcanic, granite alluvium
- Landform Moderately wide valley bottoms
- Plot Position Floodplains, terraces, toeslopes
- Elevation (ft.) 7,660 - 9,580
- Precipitation (in.) 20-60

Vegetation Structure and Composition

Deschampsia cespitosa is a major species in the dense herbaceous vegetation and usually dominates. No other species was present in all of our stands. Wetter stands included substantial amounts of *Carex aquatilis*, *C. scopulorum*, or *Calamagrostis canadensis*. Graminoids and forbs of mesic habitats — *Poa pratensis*, *Phleum alpinum*, *P. pratense*, *Antennaria corymbosa*, *Aster foliaceus*, and others — contributed considerable cover in drier stands.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
SHRUBS	0.3	0 - 1
Low	0.3	0 - 1
GRAMINOIDS	69	40 - 97
FORBS	27	0.5 - 40

Ground Cover

Percent cover of features on plot surface.

	MEAN	RANGE
Bare Soil	18	8 - 44
Gravel (2 mm - 3 in)	0.2	0 - 1
Litter & Duff	51	22 - 70
Wood (> 1/4 in diam.)	0.5	0 - 3
Moss & Lichen	14	0 - 60
Basal Vegetation	14	10 - 20
Water	8	0 - 38

Soils

GREAT GROUPS: Typic Cryofibrists; Histic Cryaquolls; Typic Cryaquepts; Humic Cryaquepts

PARTICLE SIZE CLASS: Fine loamy to Coarse loamy

AVERAGE COARSE FRAGMENTS: 0 to 50%

WATER TABLE AND MOTTLING DEPTH: Water table ranges from at the surface to 29 inches; mottling occurring from 2 to 22 inches

ROOTING DEPTH: 12 to 24 inches of rooting zone

Succession & Management Implications

The soils supporting stands of this community type usually dry out during part of the growing season, allowing easy access for grazing animals. Heavy grazing decreases the amount of *Deschampsia cespitosa* and allows less palatable species to increase (Padgett *et al.* 1989; Hansen *et al.* 1995). This type may have been much more widespread in the past, with many stands having been heavily grazed and converted to *Poa pratensis* meadows, *Juncus balticus* vegetation, or other herbaceous types.

Geographic Distribution & Other Studies

A broad *Deschampsia cespitosa* type such as we describe here has also been described by Youngblood *et al.* (1985) in western Wyoming and eastern Idaho, Padgett *et al.* (1989) in southeastern Idaho and Utah, Mutz and Queiroz (1983) in central Idaho, and Kittel *et al.* (1994) in central Colorado. In several studies, the broad range of stands dominated by *Deschampsia cespitosa* has been split into two or more types that reflect differences in soil moisture: Kettler and McMullen (1996) in north-central Colorado, Girard *et al.* (1995) in the Bighorn Mountains, and Potkin and Munn (1989) on the west slope of the Wind River Mountains. Our community type encompasses the types from those studies, as well as the *Deschampsia cespitosa-Caltha leptosepala* type of Cooper and Lesica (1992) from southwestern Montana. Hansen *et al.* (1995) recognize a broad *Deschampsia cespitosa* habitat type in Montana that apparently would support the full range of stands that we place in our plant community type, while Mattson (1984) split the sites supporting *D. cespitosa* vegetation on the Yellowstone Plateau into three habitat types.



Figure 42 Wind River, Wind River Ranger District

***Juncus balticus* Community Type
(Baltic Rush Community Type)**

Number of Stands Sampled = 2
(144V93N004, 144V93N020)

General Description

This is a herbaceous meadow type of mesic or wet habitats with a large amount of *Juncus balticus*. Scattered shrubs may occur in the stands. This type occurs over a broad range in elevation.

Location and Environment

One plot occurred within the Absaroka subsection influenced by volcanic landslide deposits. The other plot occurred within the Northern Absaroka subsection on volcanic alluvial deposits.

We sampled only two stands of this type, one in a depression on Carter Mountain and the other along the North Fork of the Shoshone River. Both stands grew on soils that are wet much of the year. Other riparian vegetation types present at the Carter Mountain site were *Carex aquatilis* wet meadow and *Salix boothii*/Mesic forb shrub vegetation. At the Shoshone River site, the *Juncus balticus* stand occurred with a *Carex rostrata* stand, a *Populus balsamifera* woodland, and a stand of *Elymus cinereus* tall grass.

Site Characteristics

Parent Material Volcanic alluvium
Landform Wide to narrow valley bottoms
Plot Position Floodplains, debris flow catchments
Elevation (ft.) 6,100 - 8,050
Precipitation (in.) 15-25

Vegetation Structure and Composition

The vegetation is a mix of graminoids and forbs in which *Juncus balticus* is one of the main species. The drier of our two stands (on Carter Mountain) was dominated by exotics (*Sonchus uliginosus* and *Trifolium hybridum*). The Shoshone River stand contained substantial amounts of *Carex aquatilis*, *C. petasata*, *Deschampsia cespitosa*, and *Potentilla gracilis*.

Community Structure

Percent canopy cover by life form and size class.

	MEAN	RANGE
	%	%
SHRUBS	15	10 - 20
Low	15	10 - 20
Medium	5	0 - 10
GRAMINOIDS	40	30 - 50
FORBS	30	20 - 40

Ground Cover

Percent cover of features on plot surface.

	MEAN	RANGE
Bare Soil	15	5 - 25
Gravel (2 mm - 3 in)	0.5	0 - 1
Litter & Duff	69	55 - 84
Basal Vegetation	15	11 - 19

Soils

GREAT GROUPS: Histic Cryaquoll; Histic Cryaquept

PARTICLE SIZE CLASS: Fine loamy

AVERAGE COARSE FRAGMENTS: 0 to 60 %

WATER TABLE AND MOTTLING DEPTH: Water table at surface; mottling occurring from 12 to 18 inches

ROOTING DEPTH: 18 to 24 inches of rooting zone

Succession & Management Implications

Many (if not all) stands of vegetation dominated by *Juncus balticus* are disturbed stands of other vegetation types, produced by grazing that reduces the cover of the more palatable grasses and sedges (*Calamagrostis canadensis*, *Deschampsia cespitosa*, *Carex nebraskensis*, *C. aquatilis*) and allows the grazing-resistant *J. balticus* to increase (Padgett *et al.* 1989; Hansen *et al.* 1995).

Geographic Distribution & Other Studies

Juncus balticus vegetation types similar to one another have been described in a variety of studies from the Rocky Mountains: Youngblood *et al.* (1985) in western Wyoming and eastern Idaho, Padgett *et al.* (1989) in southeastern Idaho and Utah, and Kittel *et al.* (1993) and Kittel *et al.* (1994) in central Colorado. Potkin and Munn (1989) described a high-elevation *J. balticus* type from the western slope of Wyoming's Wind River Mountains somewhat different in species composition than the other types. Hansen *et al.* (1995) recognize a broad *J. balticus* habitat type from Montana, and Mattson (1984) described a *Deschampsia cespitosa* - *Juncus balticus* habitat type from the Yellowstone Plateau that supports vegetation rich in *J. balticus*.



Figure 43 Carter Mountain exclosure, Wapiti Ranger District.

***Elymus cinereus* Community Type
(Basin Wildrye Community Type)**

Number of Stands Sampled = 1
(144V93N005)

General Description

This low-elevation type includes dense stands of tall *Elymus cinereus* above a lower herbaceous layer of various graminoids and forbs. Scattered shrubs may be present. Stands usually are small and grow on higher stream terraces or alluvial fans where there may be a sodium influence in the soils.

Location and Environment

This sample occurred within the Northern Absaroka subsection in LTA D05 on volcanic alluvium deposits.

We sampled only one stand of *Elymus cinereus* vegetation, along the North Fork of the Shoshone River at 6100 ft. elevation. The stand grew on a terrace ca. 2 ft. above the stream channel, in a riparian zone that includes stands of *Carex rostrata* wet meadow, *Juncus balticus* meadow, and *Populus balsamifera* woodland.

Site Characteristics

Parent Material	Volcanic alluvium
Landform	Wide valley bottom
Plot Position	Floodplain and terraces
Elevation (ft.)	6,100
Precipitation (in.)	15

Vegetation Structure and Composition

Elymus cinereus formed a dense, tall herbaceous layer over a shorter layer codominated by *Poa pratensis* and *Achillea millefolium* and containing substantial amounts of several other species of graminoids and forbs characteristic of mesic habitats.

Community Structure

Percent canopy cover by life form and size class.

	MEAN
	%
SHRUBS	10
Low	10
GRAMINOIDS	50
FORBS	30

Ground Cover

Percent cover of features on plot surface.

	MEAN
Bare Soil	3
Litter & Duff	70
Moss & Lichen	20
Basal Vegetation	20

Soils

GREAT GROUP: Typic Cryaquoll

PARTICLE SIZE CLASS: Coarse loamy

AVERAGE COARSE FRAGMENTS: 2 %

WATER TABLE AND MOTTLING DEPTH: Water table at 22 inches; mottling occurring at 22 inches

ROOTING DEPTH: 8 inches of rooting zone

Succession & Management Implications

Little information about *Elymus cinereus* vegetation is available in the literature. Large stands dominated by this grass were at one time common in the Great Basin and western Montana, but repeated, heavy spring grazing had greatly reduced their extent by the middle of this century (USDA Forest Service 1937).

Geographic Distribution & Other Studies

No *Elymus cinereus* riparian types have been described in studies in the Rocky Mountains. The grass is known to have formed large stands in valley bottoms before the rise of the livestock industry, apparently mainly in the Great Basin (USDA Forest Service 1937). In western Montana, small patches of vegetation dominated by the species occur primarily on saline-alkaline soils along low-elevation streams (Mueggler and Stewart 1980).



Figure 44 North Fork Shoshone River, Wapiti Ranger District.

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