RIPARIAN AND WETLAND VEGETATION OF CENTRAL AND EASTERN OREGON

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Bernard L. Kovalchik
and
Marie Kerr

2004

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Acknowledgements

As can be seen by its size, this book has been long in coming, and represents the work of lots of people. The project was started in 1996, inspired by the publication of the first draft of Elizabeth's Mid-Montane Wetland guide. It seemed to me that between her work, and Bud's ground-breaking Riparian Guide for Central Oregon, we were well on our way to putting something together that would represent the Intermountain portions of Oregon. I was able to convince The Nature Conservancy thanks to Cathy Macdonald, and the Environmental Protection Agency, to fund an effort to develop an inventory and classification of riparian remnants in Eastern Oregon. EPA funded the project for a year, TNC for the second, and a number of small grants from the BLM kept it alive for a third.

Marie Kerr was initially hired by the Oregon Natural Heritage Program to manage this project, and Peter Alpert agreed to help. Peter spent the first summer as a volunteer, working with me, Marie, and Dick Vander Schaaf and others to develop a methodology and begin our inventory all the areas outside of the national forest lands already inventoried, and to develop the correct methodology for sampling. Marie kept sampling different areas in eastern Oregon for two more years, but eventually left to find secure funding and a saner life working as a botanist for Idaho Power. While Marie did not actually write any of this guide she spent three entire years living the project, dodging snakes and boulders, and collecting data from Oregon's most remote areas.

Two years later, the Forest Service sent us Bud's data, and Elizabeth happily sent us hers, and I was able to convince Jon Titus to attempt to classify all of the Eastern Oregon plots. Therefore, we also need to credit all of the folks who worked on the USFS riparian crews collecting data for Elizabeth's and Bud's guides, as well as additional data collected in central Oregon. Rod Clausnitzer was the co-lead with Elizabeth on the NE Oregon guide, with thanks to Valerie Geertson, Karen Riener, Matt Koenig, Marc Weathersby and the late Shelley Josephson for invaluable field assistance and to the late Karl Urban for his botanical expertise. Thanks to Gregg Riegel, project leader and lead ecologist, and to the numerous field personnel responsible for data collection in central Oregon: Sabina Keller, David Baker, Peter Sussman, Amy Miller, Betty Kim, Eric Nicita, Larry Sandoval, Bill Johnson, Maurice Evans, Beth Vining, Thea Cook, Matt Montgomery, Joe Terry, Danna Lytchen and Nick Otting.

With a little additional support from TNC, Jon Titus, with help from me and John Christy, made steady progress developing a classification, although by 2000 it became apparent that we might never turn this into a guide. Fortunately, the Oregon Watershed Enhancement Board (OWEB) agreed to provide some funding to complete the classification and Guide, and the U.S. Forest Service, thanks to the efforts of Tom DeMeo, agreed to fund 2 months of Elizabeth Crowe's time. And even more fortunately, Elizabeth agreed to take this on, since only Elizabeth (or possibly Bud) could have actually finished this.

Even with funds from TNC, the Forest Service and OWEB, we only were able to fund about 1/3 of the year's time it took Elizabeth to write this, and so I am especially grateful for the volunteer time she put in on the project. Also, Jeremy O'Leary spent countless hours on the layout of the book, and John Christy on editing and keeping things together. I was the final editor, and accept responsibility for the errors included.

Jimmy Kagan

About the Authors

Elizabeth Crowe earned a B.S. in botany and zoology from Miami University and an M.S. in environmental science (specializing in soil-plant relationships) from Washington State University. She was the wetland/riparian ecologist for 7 years on the Malheur, Umatilla and Wallowa-Whitman National Forests and for 2 years on the Ochoco and Fremont National Forests and the Lakeview B.L.M. District. She was the lead researcher and primary author of “Mid-montane Wetland Associations of the Malheur, Umatilla and Wallowa-Whitman National Forests” (1997). She has recently worked on prairie wetland and riparian systems in eastern Montana for the Montana Natural Heritage Program and is currently working as a vegetation ecologist for the National Park Service’s Greater Yellowstone Inventory and Monitoring Network.

Bernard (Bud) Kovalchik retired in 2001 from a distinguished career as an ecologist with the U.S. Forest Service and was a pioneer in riparian and wetland vegetation community classification. He earned a B.S. in Forest Science from the University of Montana in 1968 and an M.S. in Silviculture/Forest Ecology from the University of Montana in 1971. Following graduation, Bud was stationed at the Intermountain Research Station in Missoula, Montana, and co-authored the "Forested Habitat Types of Montana" (1977). In the 1980s, he was the range and riparian ecologist for the Deschutes, Ochoco, Fremont, and Winema National Forests, where he authored the "Riparian Zone Associations of the Deschutes, Ochoco, Fremont and Winema National Forests" (1987) as well as co-authored the "Plant Associations of the Crooked River National Grasslands" (1981). Most recently, Bud was lead ecologist for the Wenatchee, Okanogan and Colville National Forests in eastern Washington, where he co-authored the "Field Guide for Forested Plant Associations of the Wenatchee National Forest" (1995) and authored the "Classification and Management of Aquatic, Riparian and Wetland Sites on the National Forests of Eastern Washington (in press, 2004).

Marie Kerr earned a B.S. in biology from Berea College and an M.S. in natural resource sciences from Washington State University. She worked as a riparian ecologist with the Oregon Natural Heritage Program on this classification and has worked for the last 6 years as a botanist for Idaho Power.

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INTRODUCTION

Aquatic, riparian and other wetland systems occupy a small portion of the landscape but provide a disproportionate amount of important habitat for unique plant species and terrestrial animals (Crowe and Clausnitzer 1997). Vegetative productivity is generally higher in riparian areas and other wetlands than in surrounding uplands, and the cooler, moister microclimate provides a contrasting habitat to that of drier uplands. Riparian areas also contribute to fish habitat and help to control floods through water storage and sediment trapping (Crawford 2001). Wetland, riparian and aquatic systems east of the Cascade Range are also of very high value for human uses including: recreation; water supplies for municipalities and irrigation districts; placer mining; crop production; livestock grazing; and transportation corridors.

The structure and components of riparian areas influence the rate, amount, and timing of water, nutrients, organic debris, and inorganic materials that enter streams and rivers. The energy of floodwaters and their ultimate volume, timing and erosive power is influenced by the soils, vegetation and geomorphology of fluvial surfaces within valley bottoms. Decades of intensive use of riparian areas and other wetlands in central and eastern Oregon have caused substantial degradation of their ecological structure, composition and function. Rehabilitation, restoration and monitoring of wetland ecosystems is currently a high priority for many land management agencies and landowners. In order to improve conditions in these habitats, an understanding of wetland ecosystems is necessary.

Classification of plant associations provides a means of stratifying these ecosystems into easily recognizable and repeatable units. Wetland plant associations integrate potential natural vegetation, soil characteristics, fluvial geomorphology, hydrology and climate. This classification provides a common framework for various disciplines to manage wetland ecosystems, including planning management activities and analyzing the effects of these activities.

Definitions of Wetlands

Wetlands occur in areas between terrestrial and aquatic systems and "are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (Federal Interagency Committee for Wetland Delineation 1989). The U.S. Fish and Wildlife Service (USFWS) wetlands classification (Cowardin *et al.* 1979) uses the term wetland vegetation to describe "vegetation within or adjacent to, and hydrologically influenced by, streams, rivers, lakes, meadows, and seeps." The term "riparian vegetation" is used in this document specifically for vegetation located within the valley of, and hydrologically influenced by, a stream or river. "Aquatic vegetation" grows in deeper, permanently standing water in lakes and ponds, or in the sluggish backwaters of streams and rivers.

Jurisdictional wetlands must, under current Federal regulations, have three components: wetland hydrology, hydric soils, and hydrophytes. Among many wetland scientists, however, the prevailing view is that functional wetlands need to meet only one of the three criteria (Hansen *et al.* 1995). Although functional wetlands do not always meet the requirements for jurisdictional wetlands, they "perform wetland functions resulting from the greater amount of water that accumulates on or near the soil surface" (Hansen *et al.* 1995). The National Technical Committee for Hydric Soils (NTCHS) defined hydric soils as soils that form "under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (NTCHS 1985; Federal Register 1995). The specific criteria a soil must meet and a list of hydric soils for the United States is available from the Natural Resources Conservation Service state office. Hydrophytes are defined as "macrophytic plant life growing in water, soil or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content" (Hansen *et al.* 1995). The U.S. Fish and Wildlife Service (Reed 1988) maintains a current list of hydrophytes and their degree of wetland affinity. The four categories of hydrophytes are defined in the glossary (Appendix A) under the term, "wetland status". Wetland hydrology is determined by the duration and depth of soil saturation or surface inundation of a site. The definition is given in the glossary in Appendix A. Further information on wetland hydrology can be found in the wetland delineation manual (Federal Interagency Committee for Wetland Delineation 1989).

Included in this classification are plant associations occurring on fluvial surfaces in valley bottoms that may not be classified as jurisdictional or even as functional wetlands but that do function as "xeric" or "transitional" riparian areas (Kovalchik 1987). These fluvial surfaces are usually terraces (abandoned floodplains).

Wetlands can be divided into two classes, lotic and lentic, based on the major hydrologic influence. The definitions given below are from Hansen *et al.* (1995):

> Lotic wetlands are associated with rivers, streams, and drainageways. Such wetlands contain a defined channel and floodplain. The channel is an open conduit that periodically, or continuously, carries flowing water, and dissolved and suspended material. Beaver ponds, seeps, springs, and wet meadows on the floodplain of, or associated with, a river or stream are part of the lotic wetland.
>
> Lentic wetlands are associated with still water systems. These wetlands occur in basins and lack a defined channel and floodplain. Included are permanent (e.g., perennial) or intermittent bodies of water such as lakes, reservoirs, potholes, marshes, ponds, and stockponds. Other examples include fens, bogs, wet meadows, and seeps not associated with a defined channel.

These definitions are important when using this classification in conjunction with the U.S. Department of Interior Bureau of Land Management's Proper Functioning Condition assessment procedure (Pritchard *et al.* 1993, 1994).

Scope and Study Area

Two riparian/wetland classifications have been completed for National Forest lands in central and northeastern Oregon (Kovalchik 1987; Crowe and Clausnitzer 1997), covering much of the mountainous, coniferous forest zones of the Blue Mountains and Eastern Cascades Ecoregions. The Oregon Natural Heritage Program sampled areas not previously classified, primarily in the Northern Basin and Range and Columbia Basin Ecoregions and in the lower elevations of the Eastern Cascades Slopes and Foothills and Blue Mountains Ecoregions (Figure 1). Data sets from all of these classification projects were combined for use in this larger classification. Previously classified associations were compared to results of analysis of the combined dataset and used wherever possible.

This riparian/wetland association classification complements upland plant association classifications for National Forest lands (Volland 1976, Hopkins 1979a, Hopkins 1979b, Hopkins and Kovalchik 1979, Johnson and Simon 1987; Johnson and Clausnitzer 1992) and complements and overlaps to some extent the ecological sites developed by the Bureau of Land Management and Natural Resources Conservation Service for uplands and riparian areas and wetlands of eastern Oregon. Systems sampled, classified and described include: aquatic ecosystems (though not exhaustively); non-riparian wetlands such as springs, seeps, slumps, wet basins, and meadows adjacent to lakes and ponds; and riparian landforms, including active (alluvial bars, streambanks, and floodplains) and inactive (terraces) fluvial surfaces within valley bottoms.

Objectives

This study has been undertaken to meet the following objectives:

- To classify native, natural riparian and wetland associations for lands in the central and eastern portions of Oregon. This classification is intended to be used by the Oregon Natural Heritage Program, watershed councils, landowners, land managers and others for the identification of associations to use in rehabilitation restoration, inventory, mapping and monitoring activities.

- To describe the general geographic, topographic, edaphic, functional and floristic features of aquatic, riparian, and wetland ecosystems.

- To describe, to the extent possible, Successional Dynamics and trends of the vegetation.

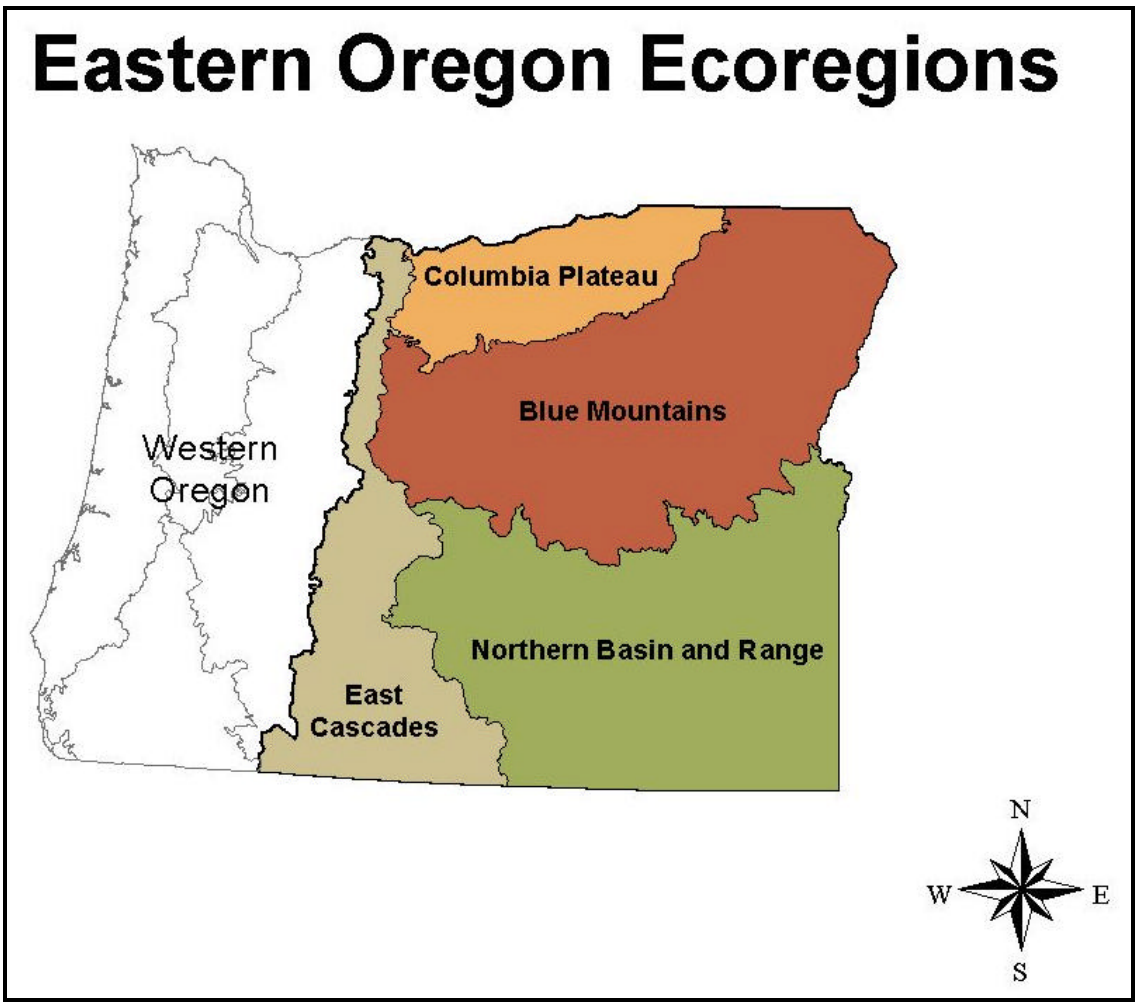


Figure 1. Ecoregions in central and eastern Oregon

The Physical Environment

Geologic substrates, climate, soils, hydrology and geomorphology are integral to the formation of riparian, wetland and aquatic systems. These factors and their relationship to the development of this classification are discussed below.

Users who are interested in obtaining further information about the physical environment of eastern Oregon are encouraged to read further in the literature cited and recommended in each section and to contact: the Oregon State Department of Geology and Mineral Industries (DOGAMI), the Oregon Climate Service (http://www.ocs.orst.edu/), the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) (formerly the Soil Conservation Service), local Oregon State extension offices, local conservation districts, state college and university geology and geography departments, and local offices of the Oregon Department of Forestry, the U.S. Forest Service, and the Bureau of Land Management.

Geology

The geologic substrates of eastern Oregon are predominantly volcanic in origin; most are extrusive in the form of basaltic, andesitic and rhyolitic flows and pumiceous and tuffaceous sediments. Some intrusive granitic batholiths and several terranes, comprising sedimentary (metamorphosed in some places), extrusive volcanics and granitic formations, occur in the Blue Mountains Ecoregion. In addition to faulting and uplifting processes, which occur in all ecoregions, glaciation has affected high mountain areas, carving cirques and U-shaped valleys and depositing sediments in valleys below. The last major geologic episode to affect much of eastern Oregon was the Mt Mazama eruption (6,000 years ago), which produced thick pumice and ash deposits. These deposits have had a tremendous influence on soil formation and properties (Orr 1992).

Geologic substrates influence riparian and wetland systems in two primary ways: 1) through the types of valleys and drainage patterns produced in particular substrates; and 2) through the typical mineral particle size characteristic of different bedrock types. An example of the latter is that streams occurring within granitic formations often carry coarser bedload materials than streams in extrusive volcanic formations.

Climate

The climate of eastern Oregon varies widely with latitude, longitude and relative elevation, producing distinctive climatic zones within ecoregions. Average annual mean temperatures range from 32-56° F and are generally colder than on the west side of the state (Figure 2).

Average last spring and first fall freeze dates are shown in Figures 3 and 4. The coldest areas of eastern Oregon are in the area covering the central part of the East Cascades Ecoregion, the northwest part of the Northern Basin and Range Ecoregion and the southern part and alpine/subalpine areas of the Blue Mountains Ecoregion. When comparing Figures 2, 3 and 4, it can be seen that there are areas that have similarly low average temperatures but longer frost free seasons. The warmest areas are in the Columbia Basin Ecoregion.

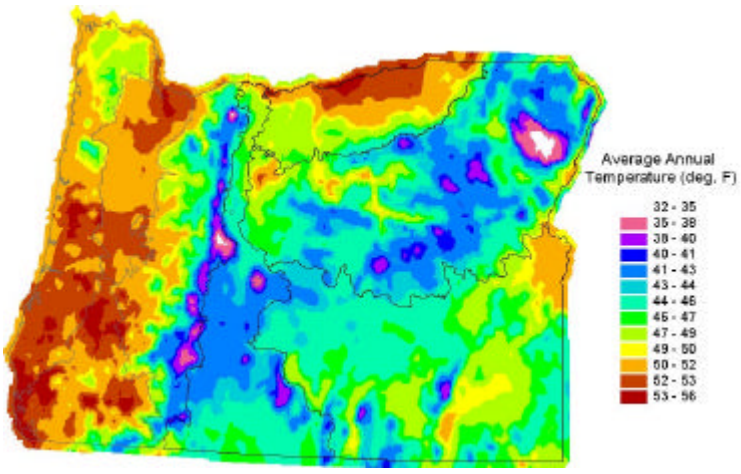


Figure 2. Average Annual Temperature in Oregon

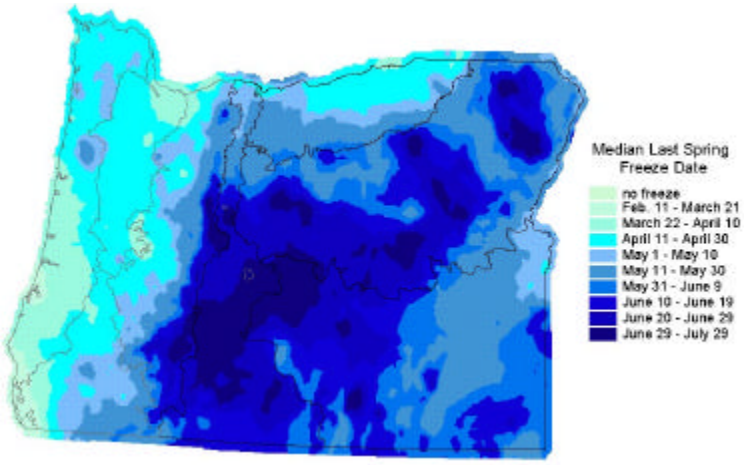


Figure 3. Median Date of Last Spring Freeze in Oregon

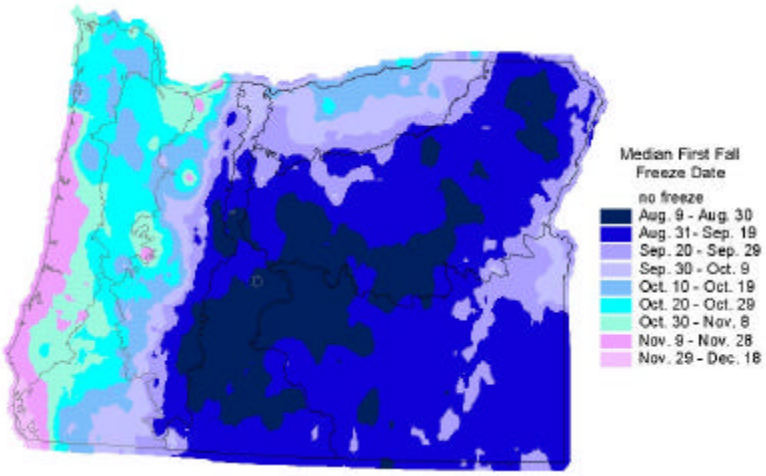


Figure 4. Median Date of First Fall Freeze in Oregon

Figures 5 and 6 show the mean annual precipitation and snowfall for the state. The mountainous areas of the Blue Mountains and East Cascades Ecoregions as well as Steens Mountain in the Northern Basin and Range Ecoregion receive the greatest amount of overall precipitation and snowfall in eastern Oregon.

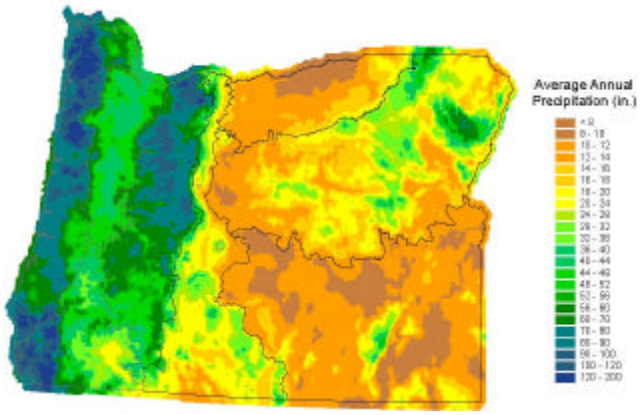


Figure 5. Average Annual Precipitation in Oregon

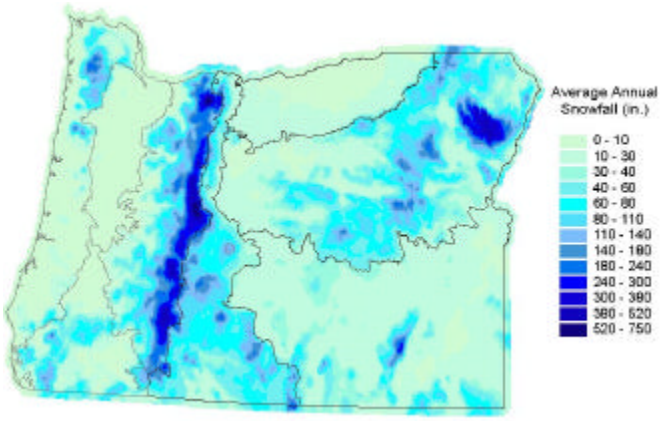


Figure 6. Average Annual Snowfall in Oregon

All of these climatic variables affect the distribution of species and, subsequently, plant association, which may otherwise occur on similar sites. For example, many deciduous shrubs occur only in the more temperate areas of eastern Oregon in the Columbia Basin Ecoregion and lower elevations of the Blue Mountains Ecoregion. Temperature and precipitation affect: 1) the long-term formation and average short-term fluvial geomorphic processes in stream systems; 2) the formation and hydrology of different types of non-fluvial wetlands and aquatic systems; 3) the weathering of geologic substrates; and 4) soil hydrology and accumulation of organic matter.

Soils

Soil properties are derived from the combined effects of climate, biota (flora and fauna), topography, parent materials and time. Parent materials of riparian and wetland soils are predominantly transported sediments. The exceptions are those seeps, springs, and occasionally bogs, where soils may develop from residual (in place) parent materials. In most other instances the soils of a riparian or wetland have developed from the lateral or vertical accretion of sediments by alluvial, colluvial, glacial and lacustrine processes. The size of particles of a deposit is a direct function of the velocity of the water at the time of deposition. Soil particle size (texture) is highly correlated to mineralogical composition of parent materials (Hansen *et al.* 1995).

Soil texture, temperature, amount and kind of organic matter, and especially water tables, have a large effect on plant species composition in riparian/wetland systems. Seasonally or permanently high water tables are necessary for a soil to support riparian and wetland vegetation. High water may be brief, with mid to late-summer drought, as in the case of the Tufted hairgrass (*Deschampsia cespitosa*) Association, or nearly season-long as in the Bladder Sedge (*Carex utriculata*) Association. Fine-textured soils have stronger capillary action and remain wetter longer than coarse soils. Organic matter also helps soil draw water up from the water table and retain it in upper soil layers. Peat bogs are especially good "sponges," whose surfaces are often saturated even when the water table lies below the soil surface (Kovalchik 2001).

Water levels also have a marked influence on accumulation of organic matter. Organic soil material is produced on site in most riparian and wetland ecosystems, although water does move some organic material from site to site. Accumulation and decomposition proceed rapidly near the soil surface and whether organic matter accumulates depends on the hydrology of the site. Under anaerobic conditions, less decomposition occurs and thick layers of organic material accumulate with time. This process is accelerated if low soil and water fertility, low soil and water temperatures, and minimally fluctuating water tables accompany anaerobic conditions, such as in bogs. The reverse is true where water tables fluctuate and soils function aerobically (Kovalchik 2001).

A common morphological characteristic of wet soils is the presence of redoximorphic features, gleying or reduction, redox depletions and redox concentrations (Vepraskas 2001). They result from a state of total lack of

oxygen in the soil. In this deoxygenated state, iron, manganese and/or sulfur will transform from oxygenated and insoluble compounds to reduced and soluble compounds. The reduced forms of these compounds are Fe^{2+}, which will appear blue or gray in color, Mn^{2+}, which will appear gray in color and H_2S, which will smell like rotten eggs. Saturated blue or gray soils are often called gleyed soils. These soluble, reduced compounds can be moved in the soil and concentrated in patches or along root or pore linings in the soil. When the soil dries and oxygen is available again, they will revert back to their oxygenated state. These concentrations are called redox (for redoximorphic) concentrations. They appear as red, brown or purplish-black soft patches or speckles, hardened nodules, or they may line the inside of pores in the soil. They vary in size, shape, and differ in color from the dominant soil. Areas of soil that have lost iron and/or manganese because of their reduction and mobilization to other locations are called redox depletions. They often appear gray or grayish-white and can be difficult to differentiate from reduced areas (Vepraskas 2001).

The most commonly occurring soils in riparian and wetland systems or eastern Oregon are in the following soil orders (Soil Survey Staff 1999):

Entisols – young soils commonly composed of coarse (cobble, gravel) to moderately fine-textured (sand and coarse silt) sediments that lack developed soil horizons (layers). They are typically found adjacent to stream and river channels and are subject to active fluvial processes such as flooding, scouring and deposition (Hansen *et al.* 1995)

Andisols – soils derived from volcanic parent materials that have predominantly andic properties (low bulk density and presence of clays commonly formed in ash and some other volcanic sediments) are common on terraces, floodplains and other stable wetland sites that have substantially fine-textured volcanic parent materials. These soils can be difficult to differentiate in the field from Mollisols, Histosols and Inceptisols.

Inceptisols – soils that develop under cool, moist or wet conditions that have one or more pedogenic horizons but no morphological characteristics that are strong enough to classify in another soil order (Hansen *et al.* 1995)

Mollisols – fine-textured mineral soils found on geomorphically stable sites, generally alluvial terraces or broad valley bottoms. Surface horizons are dark, containing 2-12% organic matter and have a high base saturation. These soils are very common on moist to dry graminoid-dominated sites.

Histosols - organic soils composed primarily of vegetative debris. There are three classes of histosols based on stage of decomposition of the organic matter: fibric (the least decomposed), hemic (between fibric and sapric) and sapric (the most decomposed). Fibric and hemic histosols are often called peats. Sapric histosols are often called ooze or muck. These soils are found on sites that are wet year-round or nearly so. Sites are generally low gradient valley bottoms, springs and seep, in backwater areas along streams and rivers and in areas flooded by beaver ponds.

Vertisols – soils with high clay contents (>30%). They are found most often in old lake beds and vernal pools.

Recommend References:

for comprehensive information about riparian/wetland soils:
Wetland Soils – Genesis, Hydrology, Landscapes and Classification (Richardson and Vepraskas, eds. 2001)

for interpreting redoximorphic features in wetland/riparian soils:
Redoximorphic features for identifying aquic conditions (Vepraskas 1992) and

for classification and identification of hydric and other soils:
Hydric Soils of the United States (NTCHS 1987)
Field indicators of hydric soils in the United States. Versions 4.0 (Hurt et al, eds. 1998)
Soil taxonomy: a basic system of soil classification for making and interpreting soil surveys (USDA-NRCS 1999)
Keys to Soil Taxonomy (USDA-NRCS 1998)

Geomorphology and Hydrology

Geomorphology is best defined as the study of landforms (Thornbury 1969, Ritter 1978). The controlling factors in the evolution of landforms are geologic structure, modification process, and stage (time) of modification. Geologic structure refers to rock orientations is space (i.e. joints, faults, bedding, and the variation of hardness or permeability of rocks), in other words, the pattern in which the earth's crust differs from location to location. For example, flat landforms may be dominant in areas with horizontally bedded, hard (not easily eroded) bedrock. If there is ample precipitation in the area, many of the wetlands formed will be wet meadows, ponds and lakes. If the same hard bedrock is uplifted and more vertically oriented, the predominant landforms may be coarse-textured streambanks and narrow floodplains along steep, straight streams.

Modification processes are the chemical, biological and physical ways by which the earth's surface undergoes changes. Vegetation may fragment bedrock in the upland and stabilize sediments in riparian zones. Water and ice wear down and erode geologic formations and then move and re-deposit sediments. The same geologic formation may weather at different rates in different climatic regimes.

Stage is where in time these processes have progressed in modifying landforms. Two watersheds in similar geologic formations that have formed at different times, i.e. basalt flows that occurred millions of years apart, may have very different characteristics. The younger watershed will probably have steeper gradients and flashier hydrologic regimes than the older watershed. These processes are described in greater detail below.

In the development of valley geomorphology, stream action is a major factor. Valley deepening is often associated with relatively early stages of landscape formation and is a result of hydrologic, corrosive, abrasive, and weathering processes on the valley floor (Thornbury 1969). Valley widening is the result of meander development, lateral erosion, mass wasting, surface erosion, and the lengthening of lateral tributaries. Valley lengthening is accomplished by headwall erosion, stream capture, and the formation of fans and deltas. For the transportation of a stream's sediment load, changes in structure or process require a change in gradient and channel characteristics (Kovalchik 2001). The gradient or steepness of a valley is often related to the width of the valley floor. Narrow valleys, often those in headwater or first-order drainages, generally have V-shaped profiles, moderate to steep gradients and narrow riparian zones. Streams in these valley segments have high energy, relatively straight channels, and support coarse bed and sediment loads. They build streambanks and terraces with moderate- to coarse-textured, well-aerated soils. In valley segments at lower relative elevations, third to fifth order drainages predominate; valley gradients are low and most valleys are wide, streams meander, and lateral erosion is usual. Stream down cutting is imperceptible or nonexistent. These streams carry fine-textured sediment loads and form floodplains with finer-textured soils. They have numerous overflow and cutoff channels (Kovalchik 2001). These wide, gentle gradient valleys may occur along smaller stream orders as well. Most streams have both steep and shallowly graded valley segments.

Wetland hydrology involves the movement (into, through, and out of) and temporal fluctuations of both groundwater and surface water in wetland systems (Richardson *et al.* 2001). All lotic and lentic wetland systems and aquatic systems are influenced by these processes. Soil hydrology, the portion of groundwater hydrology that is most important in wetland systems, has already been discussed above (see section on Soils).

Fluvial hydrology specifically involves the timing, quantity, energy and duration of fluvial (in-channel) flows and flooding (out of channel or overbank flows) on an average yearly basis (which are channel forming flows) and during larger, less frequent events.

Fluvial geomorphic processes are inextricably intertwined with the hydrologic regime of watersheds and the stream or river systems within them. Moving water erodes the outside curves of banks and deposits fresh alluvial materials on the point bars on the inside of curves. Floodplains receive surface flow, and thus sediments and nutrients, when runoff is higher than the channel capacity. During overbank flow new channels may be formed. Terraces are surfaces that are raised above the floodprone area through stream incision or tectonic uplift. They are rarely, if ever, flooded but may have high groundwater tables. Within the spectrum of mineral particle sizes carried by a particular stream system, the largest particles are generally found more on floodprone surfaces. Gentle flows over floodplains will carry small particle sizes. Higher energy, "flashy" flows will carry larger particle sizes.

Geology, local climate, valley characteristics and upland and riparian/wetland vegetation all influence the formation of fluvial landforms in valley and different channel morphologies. In this classification, the stream classification system developed by Rosgen (1996) is used to categorize stream types associated with specific associations. This system is described below in the section Content and Use of Classification/Guide.

Hierarchy of Physical Environments

Riparian, other wetland and aquatic systems can be nested within a hierarchy of larger to smaller landforms. The hierarchy consists, from its largest to its smallest unit, of ecoregions (and their subregions), hydrologic units (basins, subbasins, watersheds, subwatersheds), valley segments and fluvial (riparian) or wetland landforms or aquatic systems. This is an imperfect hierarchy in that some hydrologic units overlap more than one ecoregion or subregion. Thus, riparian, wetland or aquatic systems, and subsequently plant associations, occur in given ecoregion-subbasin-valley segment-landform combinations with particular sets of characteristics.

In the matrix table in Appendix 2 the occurrence of plant associations within the following hierarchical units is shown: ecoregions, subbasins, upland vegetation zones, valley types, and types of wetland systems (lotic, lentic, aquatic) and their fluvial surfaces or site types. Upland vegetation zones were substituted for subregions as they are more easily recognizable in the field.

Eastern Oregon Ecoregions

Climate, hydrology, geology, geomorphology, soils and dominant upland vegetation combine to form four distinctive ecoregions in eastern Oregon. Descriptions for these ecoregions and their subregions are given below. Information in these ecoregion descriptions is taken from Thorson *et al.* (2003), Clarke and Bryce (1997) and Taylor and Kagan (1998).

Blue Mountains Ecoregion

The Blue Mountains Ecoregion occupies nearly all of northeastern Oregon and extends into small portions of southern Washington and western Idaho. It encompasses three major mountain ranges—the Ochoco, Blue and Wallowa mountains. It also includes the High Lava Plains, which occupies most of the non-forested lands at the western edge of the region.

Landscapes include deep, rocky-walled canyons, glacially cut gorges, dissected plateaus, broad alluvial river valleys, and numerous mountain lakes, forests and meadows. Due to sharp elevational differences, the climate varies over broad temperature and precipitation ranges. Overall, the ecoregion is characterized by short, dry summers and long, cold winters. The flora is intermediate between the East Cascades and the western Rocky Mountains of Idaho and Montana. Species composition changes with altitude and longitude. Western juniper dominates the western portion of the region, sagebrush and grassland steppes dominate the entire eastern length of the region, ponderosa pine woodlands are characteristic at mid-elevations and mixed coniferous forests dominate at higher altitudes. Extensive grasslands occur in and north of the Wallowa Mountains, and sagebrush steppe is prevalent in the southeastern and southwestern parts.

Before European settlement, ponderosa pine savannas, basin big sagebrush steppe, native grasslands and riparian woodlands were widespread in this region. Today, many bottomland habitats have been replaced by irrigated alfalfa, juniper has expanded into many former shrub-steppe vegetation types, and ponderosa pine savannas have been cut or are being invaded by Douglas fir and grand fir.

The diversity in elevation, soils and climate yields diverse habitats and many endemic plant species. The Wallowa Mountains alone have more than 10 plants species found nowhere else. Bighorn sheep, elk and large mammal populations here are among the largest in the state. The variety in habitats, including low, mid and high elevation grasslands, shrublands and forests results in this ecoregion having more habitat diversity than all but the Klamath Mountains Ecoregion. As a result, this ecoregion contains a correspondingly high number of subregions.

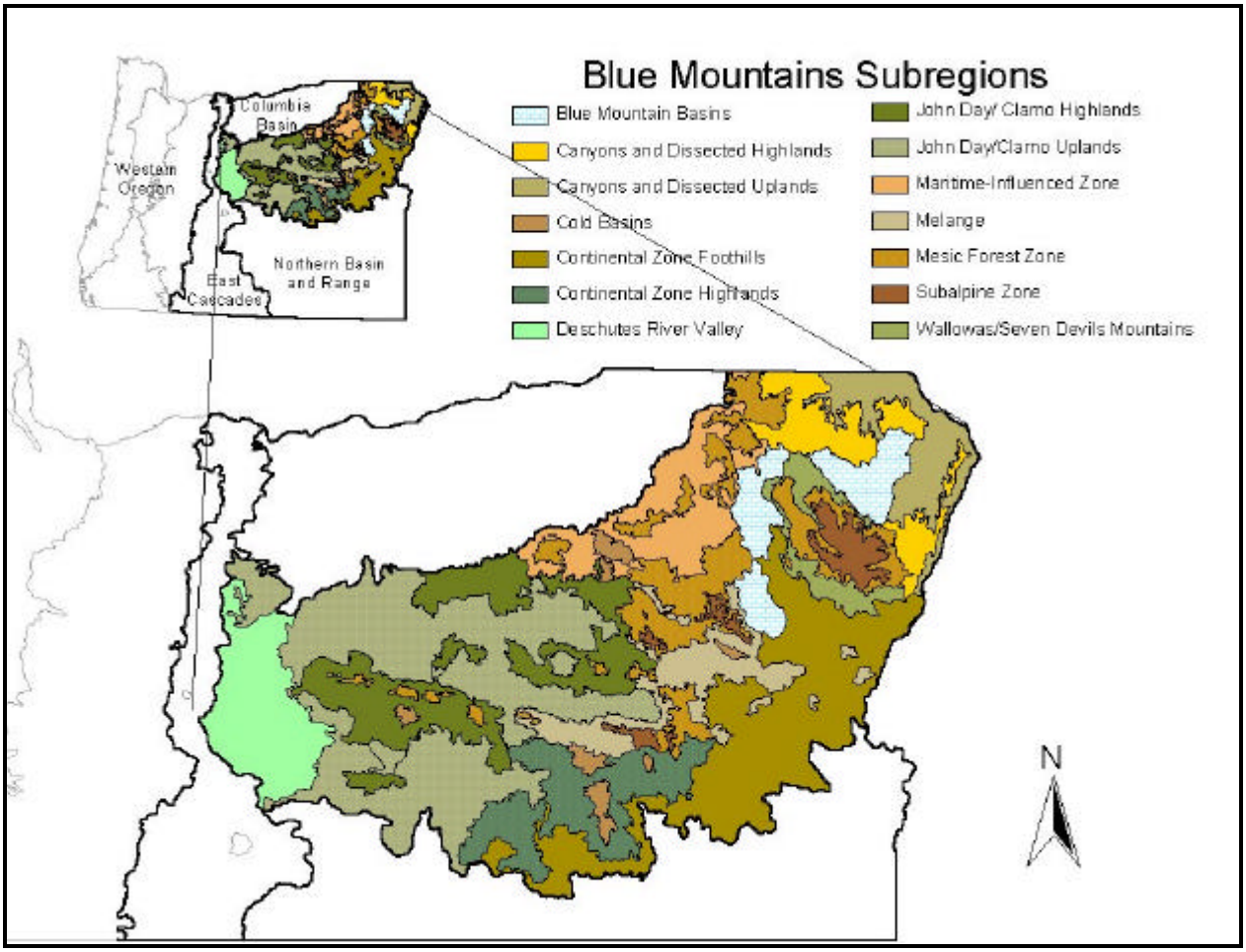


Figure 7. Subregions of Blue Mountains Ecoregion

John Day/Clarno Uplands
The John Day/Clarno Uplands are a ring of dry foothills that surrounds the western perimeter of the Blue Mountains. The "John Day Country" is a rough sea of highly dissected hills, palisades, and colorful ash beds cut by the valleys of the John Day and Crooked Rivers. Potential natural vegetation includes bunchgrasses, sagebrush, and juniper. Juniper woodland has increased markedly over the last 50 years due to a combination of climatic factors, fire suppression, and grazing pressure.

John Day/Clarno Highlands
The John Day/Clarno Highlands subregion is an area of low mountains covered in dry ponderosa pine forest. The lower ecoregion boundary occurs in a transition zone of juniper and pine mixed woodland. Because the Cascade Range creates a barrier to marine weather systems, this ecoregion has a continental climate regime: little precipitation with wide extremes in annual and daily temperatures. Historically, the forest cover was characterized by widely-spaced trees with a grass or low shrub understory, and frequent low-intensity fires that reduced overall fuel loading. Today, after years of fire suppression and logging, the open canopy has been replaced by dense thickets of young growth that carry hot, stand-replacing fires.

Maritime-Influenced Zone
The Maritime-Influenced Zone is that part of the Blue Mountains that directly intercepts marine weather systems moving east through the break in the Cascade Range at the Columbia River Gorge. Rain and snow are delivered to these mountains three seasons of the year. Loess soils, that have a moderately high water holding capacity, occur at lower elevations in proximity to the Columbia Basin Ecoregion. Because of the moisture availability, the grassland/forest boundary is at a lower elevation (about 2100 ft.) than elsewhere in the Blue Mountains. The xeric forest of ponderosa pine and Douglas-fir has a dense and diverse shrub layer beneath it.

Melange
The Melange Subregion comprises the higher elevation core of the Blue Mountains, represented by the Elkhorn, Vinegar, and Aldrich ranges. The name Melange refers to the complex geology, composed of limestones, mudstones, serpentines, metamorphic greenstones, schists, and granitic intrusions. Forest associations in this region, typically dominated by juniper, ponderosa pine, and Douglas-fir, are adapted to grow on the metamorphic substrate and droughty soil. The region also has a history of mining. Placer mining for gold has altered the structure of many streams.

Wallowas/Seven Devils Mountains
The Wallowas/Seven Devils Mountains are the highest ranges in the Blue Mountains with elevations to 9800 ft. They are composed of ocean sediments, such as limestone and mudstone, over a granitic core. This subregion covers the sedimentary portions of the mountains below 4000 feet that support a dry forest community. The character of the ponderosa pine and Douglas-fir forest varies between the moister maritime-influenced and drier continental areas, particularly in the diversity and extent of the shrub understory. Streams, following fault lines along steep gradients, have eroded deep canyons.

Canyons and Dissected Highlands
The Canyons and Dissected Highlands ecoregion includes the eastern Blue Mountains, the eastern Wallowas, and isolated islands of uplifted Columbia Plateau cut by the Snake River at Hells Canyon. Located above the unforested dry canyons (the Canyons and Dissected Upland Subregion), but in the lee of the mountains, the region is drier than the marine-influenced Mesic Forest Zone Subregion found at similar elevations to the west. The forest is dominated by Douglas-fir that can withstand the difficult growing conditions and shifting colluvial soil on steep canyon slopes.

Canyons and Dissected Uplands
In the Canyons and Dissected Uplands Subregion, deep river canyons divide the Blue Mountains from the Rocky Mountains. The Snake, Grande Ronde, Imnaha, and Salmon Rivers and their tributaries have cut the Columbia Plateau to depths of 2000 to 5000 ft. These canyons differ from their lower stretches in Columbian Basin Ecoregion in that they cut through the same metasedimentary and metavolcanic rock that forms the Wallowa and Seven Devils Mountains rather than through pure basalt. The depth of the canyons and the exposed metamorphic rocks result in stony soils on canyon slopes that retain little moisture. Bluebunch wheatgrass, Sandberg's bluegrass, and spiny greenbush are adapted to grow under these hot, dry conditions.

Continental Zone Highlands
The Continental Zone Highlands cover the south-central and southeastern Blue Mountains. Low precipitation (16-30 in/yr), high evapotranspiration, abundant sunshine, and temperature extremes characterize the climate in this ecoregion. The few perennial streams flow south to end in the Harney basin (in one portion of the High Desert Wetlands Subregion). The geology of the area differs from the Miocene basalt flows to the north; here recent volcanics of rhyolites and tuffs weather to form shallow, cobbly soil. There is no appreciable mesic forest zone in the upper elevations of this ecoregion as there is in other highland areas of the Blue Mountains. The predominant vegetation is ponderosa pine with a xeric shrub or bunchgrass understory.

Continental Zone Foothills
The Continental Zone Foothills Subregion includes the foothills bounding the southern perimeter of the Blue and Wallowa Mountains to the edge of the Idaho Batholith in the east. The combined masses of the Cascade Range and the Blue Mountains to the northwest effectively block any marine influence, creating a continental climate. The few perennial streams that occur originate in surrounding mountain ranges. As a result, plant life experiences wide temperature ranges, high evapotranspiration, and high early season moisture stress. The dominant upland vegetation is a diverse desert shrub community that differs according to soil depth, texture, and elevation. The shrublands provide valuable winter habitat for wildlife.

Blue Mountain Basins
The Blue Mountain Basins Subregion includes the Wallowa, Grande Ronde, and Baker Valleys. All three valleys are fault-bounded grabens or depressions; all are well-watered from surrounding mountains, and support irrigated agriculture for alfalfa, peas, and commercial grass seed. The climate of the Wallowa and Grande Ronde valleys is moderated by a marine influence (13-24 inches of precipitation per year), but that of the Baker Valley is more

continental and drier (9-16 inches per year). Most of the floodplain wetlands have been drained for pasture and hay, but a remnant exists in the Grande Ronde basin at Ladd Marsh.

Mesic Forest Zone
The Mesic Forest Zone is found between 4000-7000 feet in the western Wallowas, the western Seven Devils Mountains, and the higher elevation Blue Mountains. These areas are influenced by marine air coming through the Columbia River Gorge to the west. Much of the region's precipitation falls as snow that persists late into the spring. The soil has a significant ash layer that is relatively rock free and also helps to hold moisture in the dry season. The result of these factors is a highly productive and diverse forest community that includes true firs and Engelmann spruce.

Subalpine Zone
The Subalpine Zone includes the highest areas of the Elkhorn, Wallowa, Seven Devils, and Strawberry Mountains beginning near tree line at 6500 ft., where the forest cover becomes broken by alpine meadows, and continuing through alpine meadowland to include the exposed rock, snowfields, and glacial ice of the highest mountain peaks. These areas have characteristically colder soil, deeper snowpack, and a very short growing season. Forest species adapted to such conditions are subalpine fir, Engelmann spruce and whitebark pine. Historically, green fescue and sedges covered the high alpine meadows; but, following intense grazing pressure by sheep early in the 20th Century, many high elevation plant associations reverted to seral or exotic species on rocky subsoil.

Deschutes River Valley
The Deschutes River Valley is a broad, flat, predominantly basaltic valley wedged between the Blue Mountains and the Cascade Range. It is similar in climate and vegetation to the High Lava Plains Subregion south of the Blue Mountains, but its proximity to the mountains results in a much higher stream density and water availability. The core of the valley is the convergence of three major rivers: the Deschutes, Crooked, and Metolius. A system of canals carries the abundant river water to irrigated farms on floodplains and terraces. Potential natural vegetation includes bunch grasses, Wyoming big sagebrush, and juniper.

Cold Basins
The Cold Basins ecoregion includes the high, cold meadow areas in the Blue Mountains. Structurally, the basins may be depressions or synclinal downwarps in the strata of the flood basalts (for example, Ukiah basin), or the result of erosion of a soft substrate in ash or tuff areas (Fox basin). The high meadows are often alluvial, with a high water table and silt or clay soils. Streams are meandering, and if not channelized, they have a dynamic interaction with their flood plains. These unconstrained streams provide pool habitats so important to salmonids. The altitude and year-round moisture make these basins unsuitable for most crops, except hay, but they are grazed heavily by cattle and elk.

Columbia Basin Ecoregion
The Oregon portion of the Columbia Basin Ecoregion is sometimes referred to as the Umatilla Plateau. It extends from the eastern slopes of the Cascades Mountains south and east from the Columbia River to the Blue Mountains. The region continues northward throughout most of eastern Washington, including a small portion of west central Idaho. The region includes the Columbia Basin proper, and the Palouse, which is recognized by many geographers as a separate region.

The Columbia River, with its historic floods and large deposits of loess (wind-borne silt and sand) from the end of the last ice age, has greatly influenced the region. Most of the Oregon portion of the ecoregion is a lava plateau broken by basalt canyons carved out by the Deschutes, John Day, and Umatilla rivers and other streams that flow into the Columbia. The climate is arid, with cold winters and hot summers. Most of the ecoregion receives less than 15 inches of precipitation per year (some areas as little as eight inches), much of that in the form of snow.

The majority of the ecoregion's natural vegetation is native bunchgrass prairie, often called the Palouse prairie. It is characterized by deep, loess soils and plentiful grass. The majority of the ecoregion in Washington was originally sagebrush steppe. Sandy deposits along the Columbia River support open dunes, bitterbrush and steppe and western juniper. A few species of ground-squirrel and plants (milkvetch species among others) adapted to

these habitats. The rivers are characterized by riparian vegetation, with black cottonwood, willows, chokecherry and aspen dominating riverbanks. Less common are riparian areas dominated by black hawthorn and white alder.

The Columbia Basin Ecoregion is second only to the Willamette Valley in the percentage of landscape converted to non-native habitats and human uses. Protected areas and public lands are very limited in this region -- with the only vegetation types that have not declined dramatically found on lands that cannot be farmed: the steep canyon grasslands and scablands.

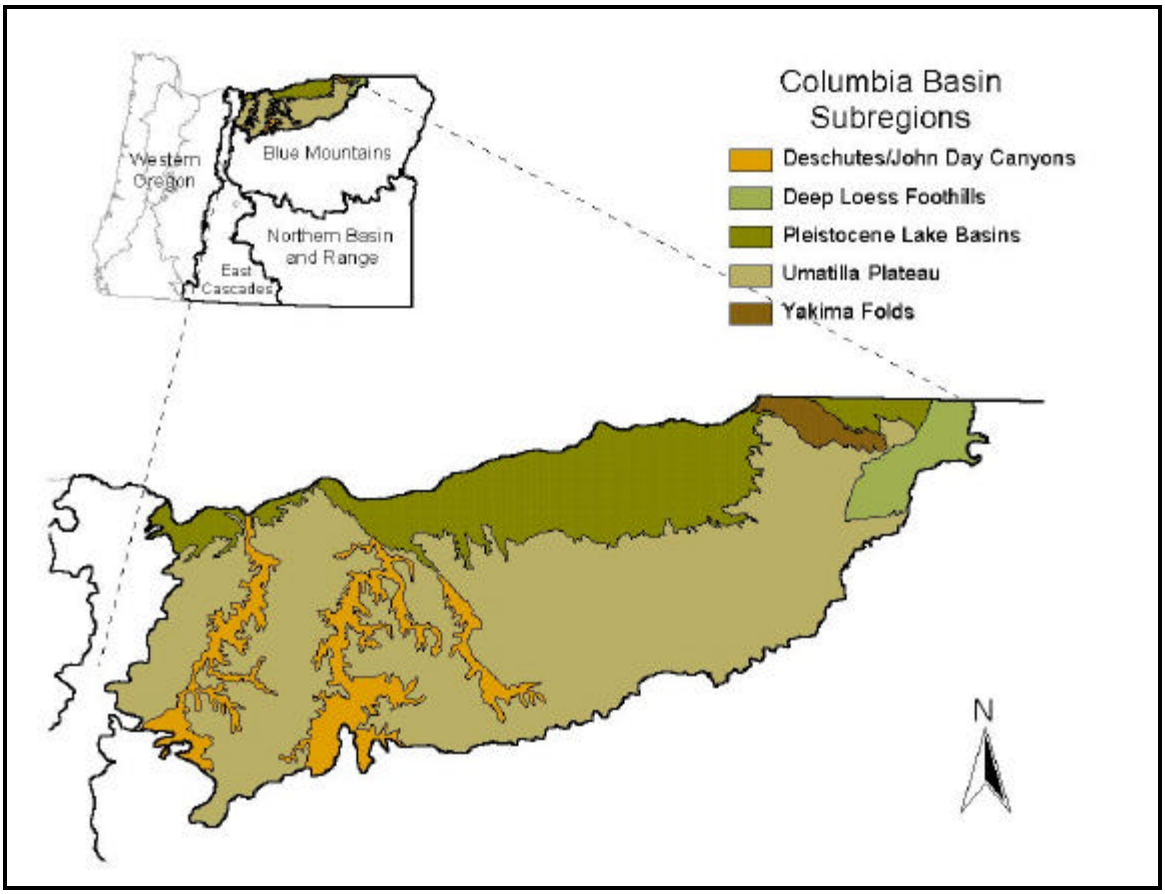


Figure 8. Subregions of Columbia Basin Ecoregion

Umatilla Plateau
The treeless Umatilla Plateau rises in stairstep terraces to meet the forested Blue Mountains Ecoregion to the south. The deep loessial soils become thinner at higher elevations, and rolling wheatfields are replaced by rangeland. Precipitation also increases with increasing elevation. Moisture levels are high enough to support grasses, such as bluebunch wheatgrass and Idaho fescue, without a sagebrush element. In the grassland to forest transition zone, shrubs such as hawthorne, rose, and snowberry occur. This subregion differs from the Deep Loess Foothills Subregion that has similar physiography, but deeper soil and higher stream density.

Pleistocene Lake Basins
The Pleistocene Lake Basins periodically filled with vast temporary lakes during the release of flood waters from glacial Lakes Missoula and Columbia during the Pleistocene. In Oregon, the flood waters gathered at the entrance to the Columbia Gorge, creating Lake Condon. High water marks and faint shorelines mark the margins of the lake basin at the 1000 to 1200 foot contour. The lake basins are the driest areas on the Columbia Plateau, receiving only 6-12 inches of precipitation per year. Native vegetation consists of bluebunch wheatgrass and sagebrush. Large areas of sagebrush have been transformed by large irrigation projects that provide Columbia River water via pump and canal.

Yakima Folds
The Yakima Fold belt is a series of unforested anticlinal ridges and synclinal valleys covering the western Columbia Plateau. Only the far eastern end of the region enters Oregon east of Wallula Gap on the Columbia River. The ridges are composed of layer upon layer of basalt, up to 12,000 feet thick. Loess blankets the south-facing slopes and supports dryland wheat farming, while grazing occurs on the steep, rocky north slopes. Located in the rain shadow of the Cascade Range, this ecoregion receives little precipitation. Sagebrush and bunchgrass associations dominate plant communities outside of heavily farmed or grazed areas.

Deep Loess Foothills
The Deep Loess Foothills follow the northwest slopes of the eastern Blue Mountains. This subregion could be a disjunct portion of the Palouse Hills Subregion in Washington, as it has Palouse soil, the same range in precipitation (16-23 in/yr), and similar land use capability in its highly productive soil. The differences lie in physiography and stream density. Instead of dunelike ridges as in the Palouse Hills, these foothills are step-like terraced ridges rising to the forested Blue Mountains. This subregion also has more perennial streams than the Palouse Hills; they are fed by the higher rainfall and snowpack of the Blue Mountains.

Deschutes/John Day Canyons
The Deschutes and John Day River Canyons cut deeply through the basalt layers of the Columbia Plateau, isolating fragments of the Umatilla Plateau Subregion. The depths of the canyons create drier conditions than those in the Umatilla Plateau Subregion, with mean annual precipitation about 10 inches per year. Vegetation is limited on rocky, colluvial soils, consisting of bunchgrasses in steeper areas, and sage and cheatgrass in grazed areas. Riparian vegetation in narrow reaches is often limited to a narrow band of white alder at the water line. Exotic alien plants, such as reed canarygrass, sweetclover and Himalayan blackberry can dominate the shoreline.

East Cascades Ecoregioin
The East Cascades Ecoregion extends from below the crest of the Cascade Range east to where the ponderosa pine zone meets the sagebrush-juniper steppe. The ecoregion also extends north into Washington and south into California. In Oregon, the ecoregion is variable, including extensive lodgepole forests on deep Mazama ash, the montane and foothill Ponderosa pine forests, Klamath Basin lakes and wetlands, and diverse montane forests. The vegetation is adapted to the prevailing dry, continental climate and is highly susceptible to wildfire.

Because they are in the rainshadow of the Cascade Mountains, the eastern slopes of the Cascades are drier than the western slopes, with annual rainfall ranging from 14-26 inches per year. Its climate exhibits greater temperature extremes and less precipitation than ecoregions to the west. It is less steep and cut by fewer streams than the west. The northern two-thirds of the East Cascades is drained by the Deschutes River system, which includes a series of large lakes and reservoirs near its headwaters. The southern third is drained by the Klamath River, which flows south and west into California.

The Klamath Basin, which extends into the Modoc Plateau in California, is a broad, relatively flat mid-elevation valley that historically supported a vast expanse of lakes and marshes. Oregon's largest lake, Upper Klamath Lake, is the biggest remnant of this wetland system. Most of the basin's wetlands have been drained and converted to agriculture.

The mountains on the northern and eastern edges of the Klamath Basin lack a generally accepted name, but include a series of peaks and ridges extending from Paulina Peak near Bend southward through the headwaters of the Williamson, Sprague and Chewaucan rivers to the Warner Mountains east of Lakeview. These mountains are generally forested, but the valleys and flats between them include large marshes, irrigated meadows and pastures, and arid juniper and sagebrush steppes. These habitats are a critical part of the Pacific flyway, supporting vast number of shorebirds and waterfowl, the densest wintering concentration of bald eagles in the world, and many other wildlife species.

Also of ecological significance is the ecological zone found at the northern end of this region in Oregon, where the Columbia River Gorge created a wealth of diversity. This Columbia Gorge transition zone, the extensive Ponderosa pine forests and woodlands, and the vast wetlands of the Klamath and upper Deschutes basin characterize this region.

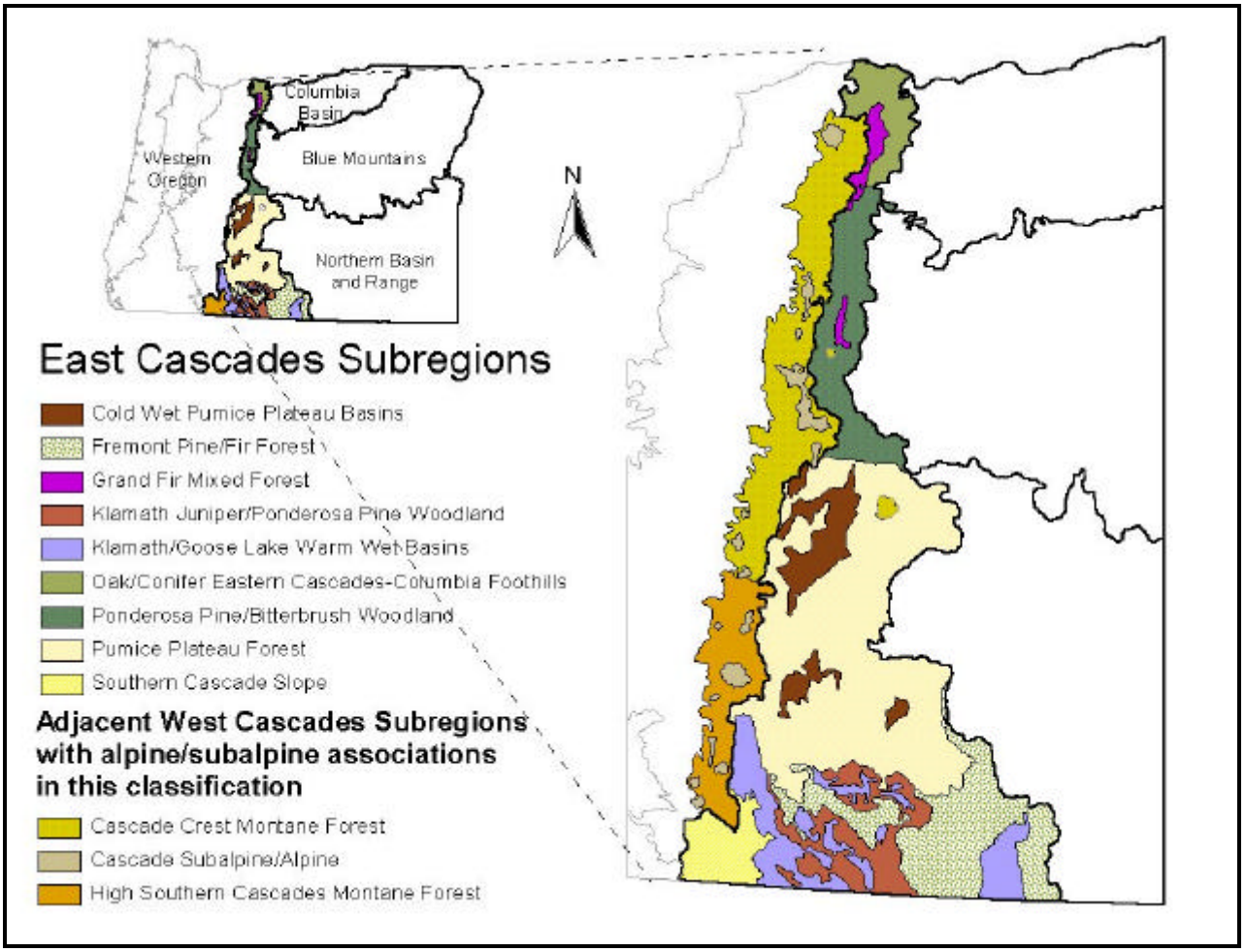


Figure 9. Subregions of East Cascades Ecoregion

Cold Wet Pumice Plateau Basins
The Cold Wet Pumice Plateau Basins Subregion includes Sycan Marsh, Klamath Marsh, and La Pine Basin. All three areas function as cold air catch-basins during the winter and have lower minimum temperatures than the Pumice Plateau Forest Subregion. Its marshes and forested wetlands are commonly 4500 to 5000 feet in elevation and are important habitat for migratory waterfowl. The La Pine Basin is underlain by thick lacustrine deposits that are characterized by high ground water levels during the spring snow melt.

Fremont Pine/Fir Forest
The terrain of the Fremont Pine/Fir Forest Subregion is composed of mountains and high plateaus. Its continental climate and diverse terrain support a range of vegetation types. Ponderosa pine woodlands are common at lower elevations while white fir is more prevalent in higher areas.

Grand Fir Mixed Forest
The Grand Fir Mixed Forest Subregion is mostly outside the limit of maritime climatic influence. It is characterized by high, glaciated plateaus and mountains, frigid soils, and a snow-dominated, continental climate. The vegetation is a mix of grand fir, Douglas-fir, and ponderosa pine.

Klamath Juniper/Ponderosa Pine Woodland
The terrain of the Klamath Juniper/Ponderosa Pine Woodland Subregion consists of undulating hills, escarpments, and plateaus. Mean annual precipitation ranges from 12 to 20 inches per year. Reservoirs dot the landscape and are important to lowland irrigation. The natural vegetation was mostly juniper in the south and a mix of ponderosa pine and juniper in the north; today, a mosaic of pastures and woodland occurs.

Klamath/Goose Lake Warm Wet Basins
The Klamath/Goose Lake Warm Wet Basins Subregion is drier than elsewhere in the East Cascades Ecoregion, yet it contains floodplains, terraces, and a pluvial lake basin. Its tule, sedge, and cattail wetlands have largely been drained for agriculture. Sagebrush and bunchgrass occur in upland areas.

Oak/Conifer Eastern Cascades-Columbia Foothills
The Oak/Conifer Eastern Cascades Columbia Foothills Subregion is more diverse than any other within the Eastern Cascades Ecoregion. Soil, climate, and landforms are all highly variable and contribute to a mosaic of vegetation types that includes grasslands, oak woodlands, Douglas-fir/ponderosa pine forests, and western hemlock/Douglas-fir forests. Maritime weather systems sometime enter this subregion via the Columbia River Gorge and moderate its otherwise continental climate.

Ponderosa Pine/Bitterbrush Woodland
The Ponderosa Pine/Bitterbrush Woodland Subregion has a terrain dominated by undulating volcanic plateaus and canyons. Its well-drained, frigid soils are often derived from ash and support nearly homogenous stands of ponderosa pine. Bitterbrush grows at lower elevations. Stands of lodgepole pines are largely absent in contrast to the Pumice Plateau Forest Subregion to the south.

Pumice Plateau Forest
The Pumice Plateau Forest Subregion is a high volcanic plateau that is thickly covered by Mt. Mazama ash and pumice. Its residual soils are somewhat excessively drained. Spring-fed creeks, marshes, and a few lakes occur. Forests of ponderosa pine are common on slopes; colder depressions and flats are dominated by lodgepole pine. Winters are consistently cold and precipitation falls mainly as snow. Summers tend to be mild.

Southern Cascade Slope
The Southern Cascades Slope Subregion is a transitional zone between the West Cascades Ecoregion to the west and the drier East Cascades Ecoregion. Forests of ponderosa pine blanket the mountainous landscape; white fir, Shasta red fir, and Douglas-fir grow at higher elevations. This subregion typically receives more precipitation than the Grand Fir Mixed Forest, Oak/Conifer Eastern Cascades-Columbia Foothills, Ponderosa Pine/Bitterbrush Woodland, Pumice Plateau Forest, Cold Wet Pumice Plateau Forest and Klamath Juniper/Ponderosa Pine Woodland Subregions.

Cascade Crest Montane Forest
The Cascade Crest Montane Forest ecoregion consists of an undulating plateau punctuated by volcanic buttes and cones that reach a maximum elevation of about 6,500 feet. Its Pliocene and Pleistocene volcanics were glaciated and numerous lakes occur. The ecoregion is extensively forested with mountain hemlock and Pacific silver fir.

Cascade Subalpine/Alpine
The Cascades Subalpine/Alpine Subregion is an area of high, glaciated, volcanic peaks that rise above subalpine meadows. Elevations range from 5,600 to 12,000 feet. Active glaciation occurs on the highest volcanoes and decreases from north to south. The winters are very cold and the growing season is extremely short. Flora and fauna adapted to high elevations include herbaceous and shrubby subalpine meadow vegetation and scattered patches of mountain hemlock, subalpine fir, and whitebark pine.

High Southern Cascades Montane Forest
The High Southern Cascades Montane Forest Subregion consists of an undulating, glaciated plateau punctuated by volcanic buttes and cones. Maximum elevation is about 7,000 feet. Its mixed coniferous forest is dominated by mountain hemlock and Pacific silver fir. Grand fir, white fir, Shasta red fir, and lodgepole pine also occur and become more common toward the south and east. This subregion tends to be drier than the Cascade Crest Montane Forest Subregion and has longer periods of summer drought and more intermittent streams.

Northern Basin and Range Ecoregion
The Northern Basin and Range Ecoregion includes much of southeastern Oregon's high desert and extends south into Nevada and extreme northeastern California. The ecoregion's name reflects its topography and geology, with numerous flat basins separated by isolated, generally north-south mountain ranges. Many of the mountains are fault blocks, with gradual slopes on one side and precipitous basalt rims on the other. In Oregon, elevations range from 2,500 feet in the lowest parts of the Owyhee and Malheur Rivers to more than 9,700 feet on Steens Mountain. Soils are generally rocky and thin, low in organic matter and high in minerals.

Another important influence in the ecoregion is the geology, which is mostly of volcanic origin. Over large portions of the landscape, soils have been derived from underlying layers of basalt and rhyolite, or occasionally from sedimentary layers that have been exposed by erosion. Of more interest than these "normal soils" are soils derived from volcanic ash and welded tuffs, which are found in distinct sites such as Leslie Gulch and Succor Creek near the Idaho border, or the extensive recent lava flows such as Devil's Garden, Diamond Craters, Jordan Craters or Saddle Butte Lava Field.

The climate is arid, with extreme ranges of daily and seasonal temperatures -- with areas in the Alvord Desert (Oregon's driest location) receiving as little as 7 inches of rain annually. Runoff from precipitation and mountain snowpacks the basins often flows into flat, alkaline playas, where it forms seasonal shallow lakes and marshes.

Also known as the sagebrush desert or high desert, the Northern Basin and Range Ecoregion contains many diverse habitats. The most significant of these are the sagebrush steppe types, salt desert scrub, riparian and wetland types, and mountain mahogany and aspen woodlands. The large wildlife refuges here support some of the largest populations of pronghorn antelope, white pelicans, and sage waterfowl, and are well known for their wildlife diversity.

The Treasure Valley and Unwooded Alkaline Foothills Subregions included in this Ecoregion are part of the Snake River Plains Ecoregion found mostly in Idaho. The Snake River Plains, a major feature in southern Idaho, extends into Oregon in northeastern Malheur County. It includes the lower Snake River valley from the county line to where the Snake leaves the state, and includes the lower valley of the Malheur River from Ontario to Harper. The Snake River Plain Ecoregion has similar vegetation as the adjacent Northern Basin and Range Ecoregion, but differs markedly in its terrain. The Snake River Plain is basically a broad river valley with low, adjacent foothills. In Oregon, most of the population is concentrated in the northeastern corner, where irrigated agriculture in the fertile lowlands along the Snake and Malheur rivers is the foundation of the local economy.

Dissected High Lava Plateau
The Dissected High Lava Plateau ecoregion contains alluvial fans, rolling plains, hills, and shear-walled canyons cut into basalt. The potential natural vegetation is mostly sagebrush steppe but scattered woodlands are found on rocky and gravelly uplands. Mollisols are common and support bluebunch wheatgrass, Wyoming big sagebrush, black sagebrush, and scattered junipers. Most soils have a frigid temperature regime. This subregion is characteristically externally drained in contrast to the High Lava Plains and the Salt Desert Shrub Valleys Subregions. A few intermittent lakes occur but are much less common than in the High Lava Plains Subregion.

High Desert Wetlands
The High Desert Wetlands are those portions of the Pluvial Lake Basins Subregion that hold water more consistently. They include remnant lakes and wetlands such as Summer Lake, Warner Lakes, and Malheur Lakes. Though water levels fluctuate from year to year, these lakes and wetlands provide critical habitat for both nesting and migratory birds, as well as associated upland birds and mammals. Typical vegetation includes greasewood, saltgrass, and basin wildrye.

High Lava Plains
The High Lava Plains Subregion covers a vast sagebrush steppe. The topography is gently rolling and punctuated by scattered volcanic cones and buttes. Intermittent lakes are a characteristic feature of the region (within the encompassed High Desert Wetland and Pluvial Lake Basins Subregions). This subregion differs from the Dissected High Lava Plateau Subregion in that it is internally drained; and as a result, the fish assemblage lacks an anadromous component. Bluebunch wheatgrass is generally associated with Wyoming big sagebrush, except in overgrazed areas where bunchgrasses have been depleted and replaced by cheatgrass.

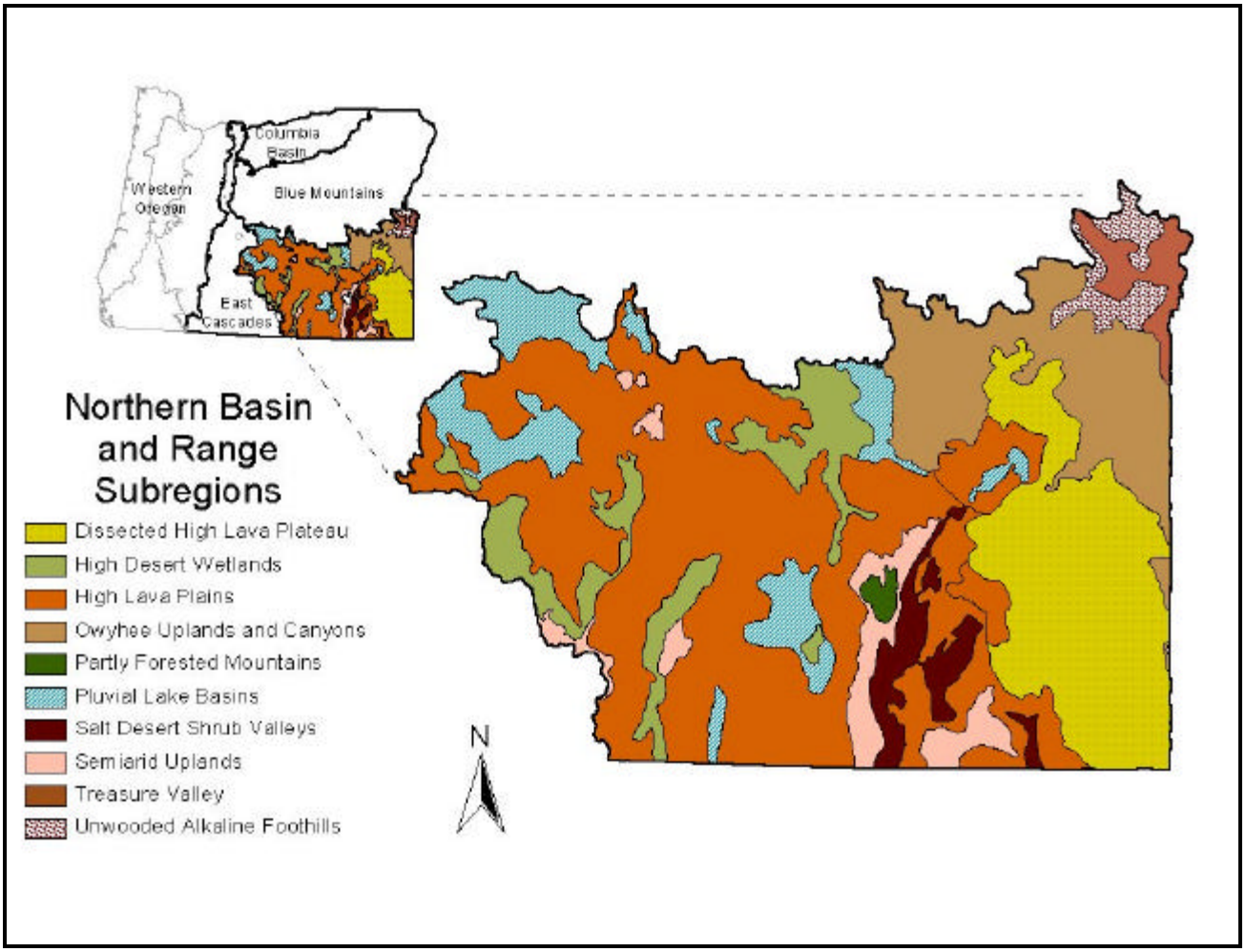


Figure 10. Subregions of Northern Basin and Range Ecoregion

Owyhee Uplands and Canyons

The Owyhee Uplands and Canyons Subregion is characterized by its geological features: deep canyons along the Owyhee River and its tributaries, open unvegetated lava fields, badlands, and ochre-colored tuffaceous outcrops riddled by caves. Though it has similar climate and vegetation, this subregion differs from the Dissected High Lava Plateau Subregion mainly in its more complex physiography, and varied geological substrate. It also has a higher stream density and more water availability than the Dissected High Lava Plateau. These characteristics, combined with the area's remote location, make it a particularly valuable refuge for wildlife. Potential natural vegetation consists of Wyoming big sagebrush, low sagebrush, Sandberg bluegrass, bluebunch wheatgrass, and Idaho fescue, which differs from the shadscale and desert shrubs of the adjacent Unwooded Alkaline Foothills Subregion south of the Snake River.

Partly Forested Mountains

The Partly Forested Mountains include mountainous areas in the northern Basin and Range ecoregion over 6500 feet, such as Steens Mountain, and the higher portions of the Owyhee Mountains. On the fault block of Steens Mountain, the gently sloping western flanks rise to 10,000 feet before plunging over the eastern escarpment to the floor of the Alvord Desert below. In this elevation range, higher precipitation, up to 25 inches per year, supports mountain big sage, snowberry, mountain mahogany, and aspen groves. Douglas-fir covers the highest elevations in the Owyhee Mountains of Idaho, although only white fir is found in this subregion in Oregon.

Pluvial Lake Basins

Water collects and evaporates on Pluvial Lake Basins in south central Oregon. The basins or playas were vast lakes during the Pleistocene glacial period. They have cooler mean annual temperatures than the basins of Salt Desert Shrub Valleys Subregion. The dry lakebeds near the Cascade Mountains have a significant ash layer present. Sagebrush dominates in finely textured, well-drained soil, and greasewood grows in more alkaline soil.

Salt Desert Shrub Valleys
The Salt Desert Shrub Valleys Subregion is composed of arid basins once inundated by ancient Lake Lahontan. Nearly flat basin floors and barren playas are extensive and wetlands, terraces, and alluvial fans also occur. Strongly saline and very alkaline soils are characteristic and have an aridic moisture regime and a mesic temperature regime. This subregion is dominated by black greasewood, inland saltgrass, alkali sacaton, basin wildrye along with spiny hopsage, budsage, and Wyoming big sagebrush. Basin floors are poorly drained, have a water table, and pond water in the spring.

Semiarid Uplands
The Semiarid Uplands Subregion covers disjunct areas across southeastern Oregon and southwestern Idaho. It includes hills, low mountains, volcanic cones, buttes and rocky outcrops rising above the high lava plains, as well as the mid-elevation zones on more massive mountain ranges, such as the Owyhee and Steens Mountains. Higher precipitation levels at these elevations support western juniper woodland with a sagebrush and Idaho fescue understory. The density and extent of juniper woodland varies with long term climate changes, grazing pressure, and fire suppression.

Treasure Valley
The Treasure Valley Subregion in now considered part of the Snake River Plains Ecoregion, along with the Unwooded Alkaline Foothills Subregion below. The amount of this region in Oregon is small enough that it is combined with the Northern Basin and Range here. This subregion flanks the Snake and Malheur rivers and is underlain by Pleistocene alluvium, loess, lacustrine, and alluvial fan deposits. Most soils have an aridic moisture regime and irrigation is required to grow commercial crops. Many canals, reservoirs, and diversions are found in this portion of the Snake River Plain and supply water to extensive pastureland and cropland as well as cities and industry. Potential natural vegetation is sagebrush and bunchgrass. Channel alteration, dams, irrigation diversions, irrigation return flow, and urban, industrial, and agricultural pollution have significantly affected water quality in many stream reaches.

Unwooded Alkaline Foothills
The Unwooded Alkaline Foothills Subregion is shrub- and grass-covered, also part of the Snake River Plains. It is characteristically underlain by sandy, alkaline deposits from ancient Lake Payette, which are absent from surrounding ecoregions. A few basalt outcrops also occur. This subregion contains rolling foothills, hills, benches, alluvial fans, and scattered badlands that have been etched into lacustrine deposits. The terrain is higher and more rugged than the neighboring Treasure Valley Subregion. Perennial streams are rare. This subregion is valuable as rangeland and wildlife habitat. Land use is generally distinct from the irrigated agriculture of the neighboring Treasure Valley but scattered areas near rivers or reservoirs that have enough water to leach out salts from the soil do support alfalfa or sugar beet farming. Potential natural vegetation is saltbush-greasewood and sagebrush steppe; the subregion is dominated by Wyoming big sagebrush, bluebunch wheatgrass, and salt tolerant shrubs, including black greasewood, four wing saltbush, and shadscale. Today, cheat grass and crested wheatgrass are also common. Plants including *Astragalus mulfordiae*, *Allium aaseae*, and *Hackelia cronquistii* grow in the sandy, alkaline, lake deposits of subregion and nowhere else.

Methods

Field Methods

Riparian, wetland and aquatic systems were sampled: from 1982 to 1985 for Kovalchik's (1987) classification for central Oregon National Forest lands; in 1989 and from 1992 to 1995 for Crowe and Clausnitzer's (1997) classification for northeast Oregon National Forest lands; and from 1995 to 1998 for the remainder of the dataset.

Stands in late seral ecological status (good ecological condition) were sampled wherever available. In areas of consistently high levels of disturbance, some mid-seral stands were sampled. Reconnaissance of the drainage was made prior to plot selection. Samples sites representing best conditions were then chosen in distinct reaches (as defined by valley gradient, valley width and elevation) of riparian/wetland zones. Most sites were marked on aerial photos and 7.5" U.S.G.S. quadrangles and have been digitized for use with geographic information system (GIS) software. For many of the sites, cross-sectional and plan-view sketches were made showing the location of fluvial surfaces and both wetland/riparian and adjacent upland plant associations at the sampling site. A stream reach might include several progressively drier, distinct series and plant associations on the succession of fluvial surfaces occurring between the aquatic and upland ecosystems. Each fluvial surface with its corresponding plant association represented a potential plot. One to several plots were sampled at each site. Plot sizes varied with the size and shape of the plants and the vegetative community. The minimum plot size was 50 sq. meters for herbaceous and shrub-dominated vegetation and 375 sq. m. for forested vegetation. In either case, the plot had to represent the stand and not include ecotones.

Valley landform descriptors (valley shape, gradient, width, sideslope gradient and aspect) were recorded for each site. Aspect, slope, microtopography and fluvial surface were recorded for each plot. A complete inventory of vascular plants and ocular estimates of canopy cover was done on each plot. Cover was estimated to the nearest percent up to 10% and to the nearest 5% thereafter. Plants not field identified to species were collected for later identification in the office. Ground cover by surface features, submergence, bare ground, gravel, rock, bedrock, moss, litter (and occasionally lichen and liverwort) was recorded using the same method.

Soils were sampled on most plots. Sampling was done either with a 3-inch diameter auger or by digging a pit with a tile spade. Field descriptions of morphological features included: current depth to water table; depth to which 90% of the vascular plant roots reach; depth to and description of redoximorphic features (mottling, gleying and depletion); thickness of the surface organic layer (if present); thickness of the epipedon (surface horizon); depth to the buried stream bed; and parent material. Individual horizon descriptions included: thickness; moist color; percentage and colors of redoximorphic concentrations (mottling and gleying) and depletions; texture; current moisture status (dry, moist, wet or saturated); percentage and size class of coarse fragments; and amount and diameter classes of roots.

For most sites, the Rosgen stream type was determined for the stream reach (where present) adjacent to the sample site and the stream width class was recorded.

Office Methods

Field data were entered and edited in a relational database using Paradox 9.0 (Corel Corporation 1999). Data management and production of association and synthesis tables were accomplished using Paradox and ECOTOOLS 2.3 (Smith 1997), a software program for ecological data analysis. Through ECOTOOLS data were also transformed for use in the statistical analyses mentioned below.

Ordination and classification programs, DECORANA (detrended correspondence analysis) (Hill 1979a), TWINSPAN (two-way indicator species analysis) (Hill 1979b), CLUSTER ANALYSIS (Volland and Connelly 1978) and CANOCO (canonical correspondence analysis) (ter Braak and Smilaur 1999) were used to develop concepts of classification group membership, species ecological amplitudes and temperature and moisture gradients encountered within a series or lifeform. This preliminary classification was based on floristic variables. Groups were then subjected to discriminate analysis (Volland and Connelly 1978, SAS 1996) to analyze environmental variables among groups. Subsequently, some subjective analysis of groups occurred based on knowledge of species autecology and disturbance history of individual plots. In addition, other vegetation

classifications were considered. Group memberships were derived and stand association tables with summary statistics produced.

Floristic Taxonomy
Wetland plant identification is considered difficult by many of the potential users of this report. Thus, considerable collections were made of willows, sedge family members, grasses and other difficult genera. Joy Mastroguiseppe, sedge taxonomy expert at Washington State University, verified sedges that the authors had difficulty identifying. Willow taxonomy follows Brunsfeld and Johnson (1985) and Hitchcock and Cronquist (1973). Taxonomy for monocots and other flora generally follows Hitchcock and Cronquist *et al.* (1973).

Classification Concepts and Terminology

Riparian/wetland systems are the manifestation of a combination of physical and biological components, structures and processes, some of which are: the average yearly flooding regime (in riparian systems), recent large flood event, average yearly groundwater movement (vertical and horizontal), soil nutrient cycling, redoximorphic chemistry, average annual soil temperature cycles, annual clay shrinking and swelling in the soils (where clay composition is high), up and down valley wind patterns, cold air inversions, annual precipitation cycles, fire history, herbivory, and plant pathogen outbreaks. Needless to say, not all of these components, structure and processes can be easily incorporated into classification units. Thus, for this classification, the predominant ecological processes and components that are manifested in relatively distinct and easily recognizable plant assemblages were used to classify associations. These processes and components are: soil texture (including coarse fragment content), water tables (including the presence of redoximorphic features), presence of organic horizons, general annual flooding regime, fluvial geomorphic surfaces, general climate (temperature, precipitation, snowfall), adjacent stream system (if present) and valley type. Herbivory and fires are also very important in influencing plant composition in communities, but are difficult to quantify on an average annual basis. Also, they generally do not affect the potential for a community to establish and develop under a given combination of the parameters listed above.

The term association was used in the naming of all taxonomic units developed in this classification. A **plant association** in this classification is "an assemblage of native vegetation in equilibrium with the environment on a specific fluvial surface (the vegetative potential on the fluvial surface)" (Kovalchik 1987 and 2001). This potential may change in time as soil and water characteristics of the fluvial surface change through erosion or, more typically, flooding and silt deposition.

Most of the associations classified and described are considered to be the latest seral potential that will develop on a riparian fluvial surface or landform under existing average annual hydrologic, geomorphic and soil development conditions. In many associations, even the occurrence of severe fires that kill the aboveground portions of the species on a site, the basic community composition and, within a few years, the community structure will be maintained – because riparian systems are adapted to disturbance, which is a dynamic equilibrium at some level. Some of the associations classified are not considered to be late seral. Some associations were not described because they are dominated by exotic vegetation, especially Kentucky bluegrass, and that was not within the scope of this project.

The classification units we create to describe riparian systems are heavily weighted toward vascular plant species composition. The reason for this is that vascular plants are both a good indicator of the biological, physical and functional parts of riparian systems and are the most easily and quickly recognizable and measurable features. In addition, if we (humans) want to monitor or influence the riparian system, we perform these functions most easily through the or manipulation, directly (e.g. planting, burning or removing vegetation) or indirectly (e.g. influencing grazing and browsing through manipulation of domesticated and wild animal populations) of vascular plants.

Nomenclature
The plant associations are named on the basis of a combination of the dominant life form plus the characteristic or dominant plant species in the various plant layers - trees/shrubs/herbs. A slash (/) is used to separate the various lifeforms in an association name and a dash (-) separates members of the same lifeform. The association may have only one species in its name, as in the case of meadows, e.g. Aquatic sedge Association; two where shrubs are superimposed over the herbaceous layer, e.g. Booth willow/Tufted hairgrass Association, or where two members of the same lifeform are dominants or indicators, e.g. Mountain alder-common snowberry Association, Tufted hairgrass-Nebraska sedge Association; or three or four where there are tree, shrub and herb layers or multiple members of the same lifeform, e.g. Engelmann spruce/Bog blueberry/Widefruit sedge Association, Black cottonwood/Mountain alder-red-osier dogwood Association.

Shade tolerance is also a consideration in nomenclature (Kovalchik 2001). Thus, the name will be suggestive of plants most capable of growing on a site in more mature stands. For example, willows may be present in small amounts in the Mountain Alder-Douglas Spiraea Association but mountain alder is used to name the association because it will dominate the willows as the plant composition and structure proceeds towards maturity.

Content and Use of Classification/Guide

Photos and Figures
Black and white photographs and diagrams of valley cross-sections were included in the association description where they were available.

Number of Plots
This is the number of plots used to describe a classified association.

Ecoregional Range
This is a list of the ecoregions in Oregon in which this association is know to occur. Ecoregions are listed as two-letter acronyms as follows (ecoregions in eastern Oregon are in bold):

BM = Blue Mountains
BR = Northern Basin and Range
CB = Columbia Basin
CR = Coast Range
EC = East Cascades
KM = Klamath Mountains
WC = West Cascades
WV = Willamette Valley

Environment and Soils
The written descriptions describe the geographic distribution of associations, the characteristic valley types, the characteristic fluvial surface(s) on which the association occurs, associated Rosgen stream types (and stream widths where data were available), and general soil features where data were available. The table shows averages and ranges for valley and plot characteristics, local climate, soils characteristics (where data were available) and soil surface cover.

Fluvial surfaces/Wetland sites
Fluvially formed geomorphic surfaces on which associations are found are:

alluvial bar: An elongated landform formed by waves and currents, usually running parallel to the shore and composed predominantly of unconsolidated sand, gravel, stones, cobbles, or stone
streambank: The sloping land bordering a channel. The bank has a steeper slope than the bottom of the channel and is usually steeper than the land surrounding the channel. It is he portion of the channel cross-section that controls the lateral movement of water.

floodplain: The nearly level alluvial plain that borders a stream. It is usually a constructional landform built of recent sediment deposited during overflow and lateral migration of the stream. In this classification it refers to the alluvial plain immediately adjacent to the stream influenced by one to three year flooding.

terrace: Deposits of alluvial soil that mark former floodplains. Typically, a valley bottom may have several sets of terraces at different elevations and of different ages (generally, the higher the elevation, the older the age).

overflow channel: A secondary channel in a valley that carries water during periods of highest flow in the main channel. Topographic height of this channel is lower than the floodplain. Overflow channels often occur either within the floodplain or between a floodplain and terrace or toeslope.

abandoned channel or oxbow: A former stream or river channel that was cut off from the rest of the stream or river and often lacks year-long standing water.

Wetland sites on which associations are found are:

spring: A groundwater discharge area with enough flow to form a channel or pool below the source.

seep: A groundwater discharge area with limited flow, not forming channels or pools below the source.

fen: A peatland dominated by graminoids and "brown mosses" (instead of sphagnum), sometimes with sparse scattered shrubs or trees. The water table is at the surface most of the year. There may be a flow of groundwater upward through the peat. These soils usually have a pH greater than 5.5, are mineral- and oxygen-rich and intergrade with bog and marsh.

bog: A soil and vegetation complex in which the lower parts are dead peat, gradually changing upwards to living plant tissues, that are elevated above the influence of groundwater, so that the only source of water is precipitation. The peat is usually saturated, acidic (pH less than 5.5), nutrient poor, and dominated at ground level by sphagnum moss. Bogs may be either forested or open. They are distinguished from swamps by their low pH and the presence of peat deposits.

wet meadow: A herbaceous wetland on mineral soil. Generally, wet meadows occur in basins and flats and are wet for most of the growing season. They are especially prominent on the margins (transition zones) of wetlands with organic soil.

moist meadow: Similar to wet meadows except that soils are dry for part of the growing season.

dry meadow: Similar to wet meadows except that soils are dry for most of the growing season.

shrub basin: A depression or hollow in the land surrounded by higher ground in which shrubs are the dominant overstory vegetation. Shrub basins may be wet, moist or dry like the meadows described above.

forested basin: A depression or hollow in the land surrounded by higher ground in which trees are the dominant overstory vegetation. Forested basins may be wet, moist or dry like the meadows described above.

Valley environment

The written description and table describe the character of the valleys in which associations occur. Parameters for measured classes are:

Valley Width:	Very Broad	> 300 meters	(>990 feet)
	Broad	100-300 meters	330-990 feet)
	Moderate	30-100 meters	(100-330 feet)
	Narrow	10-30 meters	(33-100 feet)
	Very Narrow	< 10 meters	(<33 feet)

Valley Gradient:	Very low	< 1%
	Low	1-3%
	Moderate	4-5%
	Steep	6-8%
	Very Steep	> 8%

Rosgen Stream Classification

This stream classification system "provides all disciplines with a standard method for describing and communicating about stream morphology, how streams fit the landscape and how management actions affect them" (Kovalchik 2001). Streams adjacent to most sample plots were classified according to the Rosgen stream classification system to establish correlations between valley segments, Rosgen channel types, fluvial surfaces and plant communities. Streams generally fit one of the following common classes (Figure 11):

A channels = steep, highly entrenched, step pool systems with high sediment transport potential
B channels = gentle to moderately steep terrain, moderate gradient streams that are moderately entrenched, have low sinuosity and are riffle-dominated
C channels = low gradient, moderately high sinuosity, pool/riffle bedform with well-developed floodplains
D channels = braided with moderate channel slope
E channels = very low gradient, highly sinuous, with low width to depth ratios
F channels = highly entrenched, high width to depth ratio streams

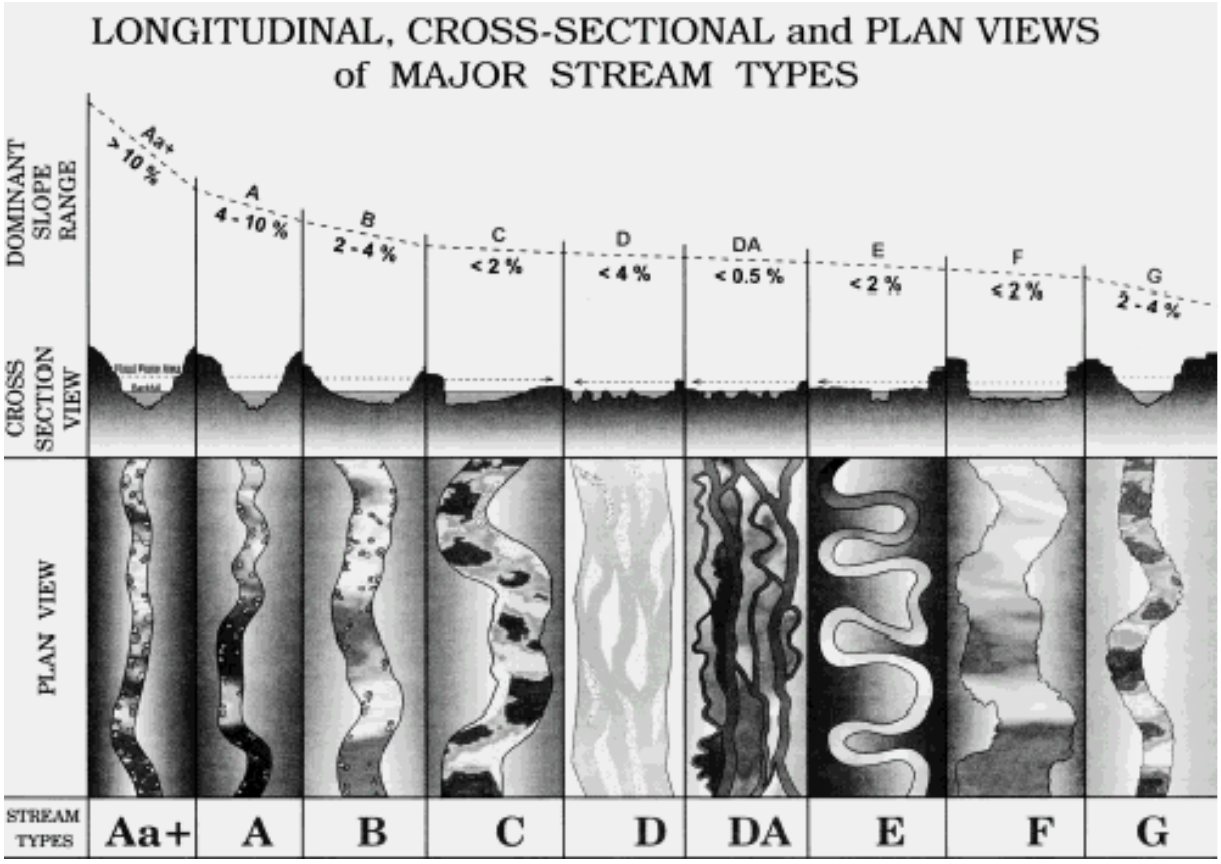


Figure 11. Rosgen stream classification

Local Climate

Mean annual averages and ranges are given for precipitation, snowfall, average, minimum and maximum temperatures. Average and ranges of median dates of the last spring and first fall freeze are also shown. These values were compiled (by the U.S.D.A. Central Oregon Interagency Ecology Program) through a geographic information system by overlaying modeled (PRISM) Oregon climate data (Daly and Taylor, 1961-1990; Daly *et al.* 1961-1990) onto sample plot locations.

Soil Surface Cover

These values are the percentage of the sample site ground surface covered by water (submerged), bare soil, gravel, rock, bedrock, crytogams (moss, liverworts, lichens sometimes listed separately if data were available) and organic litter. If there were several layers of the above, the total exposure of the uppermost layer was recorded.

Soils
Features described in the written description and/or the environment table, include: surface horizon or layer textures, depth to water table (at the time of sampling and through growing season), depth to wet (field capacity) soil surface flooding, rooting depth (this is the depth of 80-90% of very fine and fine roots, not the total depth of all plant roots), depth to redoximorphic features and depth to percentages of coarse fragments. Where sufficient soil profile description data was available for an association a table of soil profile characteristics was included in the description.

Vegetation Composition
A brief description of the principal dominant and/or characteristic species comprising the association is followed by a table showing constancy, average cover and range of cover within the association.

Adjacent Vegetation
The upland vegetation zone within which the association is found is described, generally through a list of actual upland vegetation associations that are adjacent to sample sites.

Successional Dynamics
A brief description of Successional Dynamics within the association is given. Effects of herbivory and fire are the most commonly described disturbance processes.

Nearby Studies Documenting Assocation with Plot Data
These studies contain descriptions of similar associations that were classified based on plot data.

Nearby Studies Documenting Association without Plot Data
These studies described the association from field observation only.

Use of the Key

1. Use this key for riparian and wetland plant associations located in central and eastern Oregon.

2. Determine the boundaries of the various riparian stands that exist within the riparian or wetland zone being investigated.

3. Locate a plot in a uniform and representative portion of each stand. In forested or large shrub (e.g. water birch) vegetation the plot size should be a circle approximately 375 m^2 (approx. 11 m radius) or 1/10-acre plot (approx. 37 feet radius in size. In smaller shrub and herbaceous vegetation the plot should be at least 50 $m^{2.}$ Small or irregularly shaped stands may need smaller or irregularly shaped plots. Stay near the center of the stand and avoid ecotones or crossing stand boundaries.

4. Identify and record canopy coverages for all key indicator species as elevation, plot slope, valley characteristics (shape, gradient, width, sideslope gradient, aspect) and fluvial surface or wetland site type. Optional data are soil surface cover, Rosgen stream type (if there is an associated stream) and soil characteristics, such as depth to water table, depth to coarse fragments (especially 30% and 80%), depth to redoximorphic features and presence and thickness of surface organic layers.

5. While on the plot, key to the appropriate lifeform group. In general, a species or group of species will appear to dominate a community if the cover is 25 percent or more.

6. Within the lifeform group, key to the appropriate aquatic, riparian or wetland plant association. All conditions stipulated in the key must be satisfied in order to make a correct determination. Complete the selection by comparing the community composition and site characteristics with written descriptions and the stand tables in the appendix. In addition, when classifying a site, be aware of and account for microsites. Microsites are small areas that are atypical for the stand or site as a whole. Examples include small depressions such as windthrow holes, raised hummocks within bogs, etc.

7. The key and written descriptions are based largely on samples of relatively undisturbed stands in late seral ecological status. On disturbed sites, e.g. where excessive grazing has occurred or where a fire has recently burned, evaluate each stand against the written descriptions for the associations. Use the landform and fluvial surface key to riparian associations for disturbed sites. In addition, extrapolation from the nearest non-disturbed condition occurring on a comparable site will assist in the correct determination of the type.

8. Depauperate undergrowth: in stands where the undergrowth is obviously reduced in cover from heavy grazing, shade, litter and competition from conifers or shrubs, adjust keys downward to reflect the scant herbaceous cover. In addition, extrapolation from the nearest non-depauperate condition occurring on a comparable site will assist in the correct determination of the type.

9. Highly disturbed stands may not key very well and users will have to refer to the plant associations descriptions and valley cross-section sketches and to their personal experience and intuition. Also, in any dynamic ecosystem (aquatic, riparian and wetland included) variation can be expected in a plant association.

Caution! The potential of a site may change if there is a long-term change in the soil and/or water characteristics of the site.

Warning! **The key is not the classification!** Validate your determination by comparing the site characteristics with the written description of the type. Be aware that the environmental conditions described in the text are from both sampled sites and personal observations and may not include all the sites on the landscape in which the type is found.

Recommended References:
For further information on fluvial geomorphology:
Fluvial Processes in Geomorphology (Leopold *et al.* 1964)

For information on wetland hydrology:
Wetlands (Mitsch and Gosselink 1993)

For information on stream classification and relationship to fluvial hydrology and geomorphology:
Applied River Morphology (Rosgen 1996)
Channel classification, prediction of channel response, and assessment of channel condition (Montgomery and Buffington 1993)

Miscellaneous vs. Major Associations

A number of the associations and communities included are known from limited samples in Oregon, either because they are poorly sampled or are more common elsewhere. These are included in the keys and in the guide, but have been identified with an asterisk following the name of the association (both in the table of contents and in the text). These are recognized here as valid association names, but given the limited data, should be evaluated based on occurrences elsewhere if possible.

KEYS TO THE MAJOR ASSOCIATIONS

Key to Lifeform Groups

1a. Sites aquatic. Vegetation rooted in substrate and either emergent from, floating on or submerged beneath water surface ..... Go to **Key to Aquatic Associations** (p.26)
1b. Sites not aquatic ..... Go to 2

2a. Sites dominated by trees. Mountain alder (*Alnus incana*), water birch (*Betula occidentalis*), and willows (*Salix* spp.) are considered shrubs in this classification. Deciduous and coniferous trees have a combined canopy cover of at least 25% ..... Go to 3
2b. Sites dominated by shrubs, graminoids or forbs ..... Go to 4

3a. Conifers dominate the stand. Deciduous trees, if present, are clearly subordinate to conifers ..... Go to **Key to Coniferous Forest Associations** (p.28)
3b. Deciduous trees are at least co-dominant with conifers in the tree layers ..... Go to **Key to Deciduous Forest Associations** (p.35)

4a. Sites dominated by shrubs with a combined canopy cover or at least 25% ..... Go to **Key to Shrub Associations** (p.39)
4b. Shrubs scattered at low cover or absent and canopy cover less than 25% ..... Go to 5

5a. Sites dominated by graminoids or grasses ..... Go to **Key to Graminoid/Grass Associations** (p.49)
5b. Sites dominated by forbs; graminoids and grasses subordinant ..... Go to **Key to Forb Associations** (p.53)

Key to Aquatic Associations

1a. Sites are perennial lakes or ponds, not reservoirs or stock ponds that are periodically emptied or with a highly fluctuating water level. ..... Go to 4
1b. Sites not as above ..... Go to 2

2a. Sites are: stock ponds, oxbows or deep, slow-moving sections of very low gradient streams. ..... Go to 19
2b. Sites not as above ..... Go to 3

3a. Sites are shallow sections of perennial streams, either low or high gradient, with moderate to fast-moving water. ..... Go to 30
3b. Sites not as above ..... Try **Key to Lifeform Groups** again

4a. Rocky Mountain pondlily (*Nuphar lutea* ssp. *polysepala*) at least 25% cover or the dominant species ..... **Rocky Mountain pondlily Association** (p.62)
4b. Not as above ..... Go to 5

5a. Pondweeds (*Potamogeton* spp.) at least 25% cover or the dominant species. Association identification based on dominance of individual pondweed species
..... **Diverse-leaved pondweed** (*Potamogeton diversifolius*) **Association**
..... **Grass-leaved pondweed** (*Potamogeton gramineus*) **Association**
..... **Floating pondweed** (*Potamogeton natans*) **Association**
5b. Not as above ..... Go to 6

6a. Needle spikerush (*Eleocharis acicularis*) at least 25% cover or the dominant species. Sites alpine or subalpine. ..... **Needle spikerush Association** (p.74)
6b. Not as above.....Go to 7

7a. Narrowleaf bur-reed (*Sparganium angustifolium*) at least 25% cover of the dominant species
.....**Narrowleaf bur-reed Association** (p.58)
7b. Not as above .....Go to 8

8a. Canadian waterweed (*Elodea canadensis*) at least 25% cover or the dominant species.....**Canadian waterweed Association** (p.70)
8b. Not as above.....Go to 9

9a. Delicate spikerush (*Eleocharis bella*) at least 25% cover or the dominant species. Sites alpine or subalpine.....**Delicate spikerush Association** (p.75)
9b. Not as above .....Go to 10

10a. Bog buckbean (*Menyanthes trifoliata*) at least 25% cover or the dominant species
..... **Bog buckbean Association** (p.61)
10b. Not as above.....Go to 11

11a. Northern mannagrass (*Glyceria borealis*) at least 25% cover or the dominant species
.....**Northern mannagrass Association** (p.64)
11b. Not as above .....Go to 12

12a. Threeway sedge (*Dulichium arundinaceum*) at least 25% cover or the dominant species.....**Threeway sedge Association** (p.76)
12b. Not as above .....Go to 13

13a. Tall bulrushes (*Schoenoplectus* spp.) at least 25% cover or the dominant species. Association identification based on dominance of individual bulrush species.
..... **Hardstem bulrush** (*Schoenoplectus acutus*) **Association** (p.71)
..... **Softstem bulrush** (*Schoenoplectus tabermontani*) **Association** (p.70)
13b. Not as above .....Go to 14

14a. Weak alkaligrass (*Torreyochloa pallida* var. *pauciflora*) at least 25% or the dominant species..... **Weak alkaligrass Association** (p.65)
14b. Not as above.....Go to 15

15a. Water-cress (*Rorippa nasturtium-aquaticum*) at least 25% cover or the dominant species
.....**Water-cress Association** (p.74)
15b. Not as above .....Go to 16

16a. Common cattail (*Typha latifolia*) at least 25% cover or the dominant species
..... **Common cattail Association** (p.56)
16b. Not as above.....Go to 17

17a. Creeping spikerush (*Elocharis palustris*) at least 25% cover or the dominant species
..... **Creeping spikerush Perennial Stream/Pond Association** (p.66)
17b. Not as above .....Go to 18 or try beginning of aquatic key again

18a. Vernal starwort (*Callitriche palustris*) at least 25% cover or the dominant species
..... **Vernal starwort Association** (p.69)
18b. Not as above.....Go to 19

19a. Coontail (*Ceratophyllum demersum*) at least 25% cover or the dominant species ..... **Coontail Association** (p.69)
19b. Not as above ..... Go to 20

20a. Water crowfoot (*Ranunculus aquatilis*) at least 25% cover or the dominant species ..... **Water crowfoot Association** (p.60)
20b. Not as above ..... Go to 21

21a. Water-cress (*Rorippa nasturtium-aquaticum*) at least 25% cover or the dominant species ..... **Water-cress Association** (p.74)
21b. Not as above ..... Go to 22

22a. Common cattail (*Typha latifolia*) at least 25% cover or the dominant species ..... **Common cattail Association** (p.56)
22b. Not as above ..... Go to 23

23a. Creeping spikerush (*Eleocharis palustris*) at least 25% cover or the dominant species ..... **Creeping spikerush Perennial Stream/Pond Association** (p.66)
23b. Not as above ..... Go to 24

24a. Water-cress (*Rorippa nasturtium-aquaticum*) at least 25% cover or the dominant species ..... **Water-cress Association** (p.74)
24b Not as above ..... Go to 25

25a. Creeping spikerush (*Eleocharis palustris*) at least 25% cover or the dominant species ..... **Creeping spikerush Perennial Stream/Pond Association** (p.66)
25b. Not as above ..... Go to 26

26a. American speedwell (*Veronica americana*) at least 25% cover or the dominant species ..... **American speedwell Association** (p.63)
26b. Not as above ..... Undescribed Aquatic Association

Key to Coniferous Forest Associations

1a. Lodgepole pine (*Pinus contorta* spp. *latifolia*) forms nearly pure stands. Other conifers scattered to absent ..... Go to **Key to Lodgepole pine Associations** (p.29)
1b. Lodgepole pine occurs in mixed stands or is absent. In the absence of fire, other conifers will clearly replace lodgepole pine through succession ..... Go to 2

2a. Subalpine fir (*Abies lasiocarpa*) at least 5% cover ..... Go to **Key to Subalpine fir Associations** (p.30)
2b. Subalpine fir scarce to absent; cover less than 5%. ..... Go to 3

3a. Engelmann spruce (*Picea engelmannii*) cover at least 5 %, usually dominant although lodgepole pine may dominate seral stands. Sometimes co-dominant with white fir (*Abies concolor*) or subalpine fir (*Abies lasiocarpa*). ..... Go to **Key to Engelmann spruce Associations** (p.31)
3b. Engelmann spruce scarce or absent. ..... Go to 4

4a. Grand fir (*Abies grandis*), white fir (*Abies concolor*) or western white pine (*Pinus monticola*) at least 5% cover ..... Go to **Key to Grand fir, White fir and Western white pine Associations** (p.33)
4b. Grand fir scarce to absent; cover less than 5%. ..... Go to 5

5a. Douglas fir (*Pseudotsuga menziesii*) at least 5% cover
.....Go to **Key to Douglas fir Associations** (p.34)
5b. Douglas fir scarce to absent; cover less than 5%.....Go to 6

6a. *Ponderosa pine (Pinus ponderosa) and/or incense cedar (Calocedrus* decurrens) at least 5% cover.....Go to **Key to Ponderosa pine Associations** (p.35)
6b. Ponderosa pine scarce to absent; cover less than 5%.
.....Unclassified coniferous association or go back to **Key to Lifeform Groups**

Key to Lodgepole pine Associations

1a. Bearberry (*Arctostaphylus uva-ursi*) or mountain gooseberry (*Ribes montigenum*) dominate the shrub layer. Bog blueberry and Douglas' spiraea are scarce
..... **Lodgepole pine/Bearberry-mountain gooseberry Association** (p.465)
1b. Bearberry scarce or subordinant to willows, bog blueberry or Douglas' spiraea.....Go to 2

2a. Willows (*Salix* spp.), bog birch (*Betula nana*), bog blueberry (*Vaccinium uliginosum*), dwarf huckleberry (*Vaccinium caespitosum*), Douglas' spiraea (*Spiraea douglasii*) and bearberry dominate the shrub layer. Combined canopy cover of these shrubs at least 25%, and shrubs are not restricted to microsites.
.....Go to 3
2b. The above shrubs are subordinant to the herbaceous layer. Combined canopy cover of these shrubs is less than 25%.....Go to 7

3a. Bog sites characterized by cold, water-saturated peat soils and high moss cover. Trees widely spaced and often restricted to hummocks. Few-flowered spikerush (*Eleocharis quinqueflora*) at least 5% cover. Bog birch, willows and/or bog blueberry low in stature
..... **Lodgepole pine-Engelmann spruce (*Picea engelmannii*)/Few-flowered spikerush Association** (p.444)
3b. Site and vegetation not as above.....Go to 4

4a. Bog blueberry at least 5% cover, usually dominant but occasionally subordinant to willows, bog birch, other blueberries and huckleberrys, or Douglas' spiraea.....Go to 5
4b. Bog blueberry scarce to absent. Douglas' spiraea at least 5% cover, usually dominant but occasionally subordinant to willows or bog birch. .....Go to 6

5a. Widefruit sedge (*Carex angustata*) at least 5% cover. Sites moist to wet. Willows and bog birch often abundant. .....**Lodgepole pine/Bog blueberry/Widefruit sedge Association** (p.449)
5b. Widefruit sedge scarce to absent. Sites drier.
.....**Lodgepole pine/Bog blueberry Association** (p.447)

6a. Widefruit sedge (*Carex angustata*) at least 5% cover. Sites moist to wet. Willows and bog birch often
abundant.....**Lodgepole pine/Douglas' spiraea/Widefruit sedge Association** (p.454)
6b. Widefruit sedge scarce to absent. Sites drier.
.....**Lodgepole pine/Douglas' spiraea Association** (p.451)

7a. Bog sites characterized by cold, water-saturated peat soils and high moss cover. Trees widely spaced and often restricted to hummocks. Few-flowered spikerush (*Eleocharis quinqueflora*) at least 5% cover. Bog birch, willows and/or bog blueberry low in stature
Lodgepole pine-Engelmann spruce/Few-flowered spikerush Association..... (p.444)
7b. Site and vegetation not as above.....Go to 8

8a. Widefruit or aquatic sedge (*Carex aquatilis* var. *aquatilis*) dominates other graminoids, grasses and forbs. .....Go to 9
8b. Bluejoint reedgrass (*Calamgrostis canadensis*) or tufted hairgrass (*Deschampsia cespitosa*) dominates other grasses, graminoids and forbs. .....Go to 10

9a. Widefruit sedge (*Carex angustata*) dominant. Sites usually in the Pumice Plateau Forest and Cold, Wet Pumice Plateau Basins subregions in the East Cascades Ecoregion (see Figure 9).
..... **Lodgepole pine/Widefruit sedge Association** (p.457)
9b. Aquatic sedge (*Carex aquatilis*) dominant.
.....**Lodgepole pine/Aquatic sedge Association** (p.459)

10a. Bluejoint reedgrass (*Calamagrostis canadensis*) dominates other graminoids
..... **Lodgepole pine/Bluejoint reedgrass Association** (p.462)
10b. Tufted hairgrass (*Deschampsia caespitosa*) dominates other graminoids
.....**Lodgepole pine/Tufted hairgrass Association** (p.463)

Key to Subalpine fir Associations

1a. Microtopography on sites consists of obvious hummocks and swales with an height difference between hummock tops and swale bottoms of 30-100 cm. Most trees and shrubs are confined to hummocks. Hydrophytic (water-loving) grasses and sedges are confined mostly to swales.....Go to 2
1b. Sites and vegetation not as above .....Go to 6

2a. Labrador tea (*Ledum glandulosum*) cover greater than 25%. .....Go to 3
2b. Labrador tea cover less than 25%. .....Go to 5

3a. Holm's sedge (*Carex scopulorum*) cover greater than 5%. .....Go to 4
3b. Holm's sedge scarce to absent.
..... **Subalpine fir/Labrador tea-grouse huckleberry Association** (p.414)

4a. Smooth-stemmed sedge (*Carex laeviculmis*) at least 5% cover. Common horsetail (*Equisetum arvense*) at least 25% cover.
..... **Engelmann spruce-subalpine fir/Labrador tea Swamp Association** (p.408)
4b. Smooth-stemmed sedge and common horsetail scarce to absent.
.....**Subalpine fir-Engelmann spruce/Labrador tea/Holm's sedge Association** (p.412)

5a. Bog blueberry (*Vaccinium uliginosum*) at least 5% cover. Holm's sedge at least 5% cover.
..... **Engelmann spruce-subalpine fir/Bog blueberry/Holm's sedge Association** (p.410)
5b. Sites without hummock-swale topography and vegetation not as above.....Go to 6

6a. Bluejoint reedgrass (*Calamagrostis canadensis*) at least 15% cover.
..... **Subalpine fir/Bluejoint reedgrass Association** (p.421)
6b. Bluejoint reedgrass less than 15% cover. Grasses and graminoids subordinate to forbs in the herbaceous layer. .....Go to 7

7a. Ladyfern (*Athyrium filix-femina*) at least 5% cover
..... **Subalpine fir/Ladyfern Association** (p.416)
7b. Ladyfern scarce to absent .....Go to 8

8a. Arrowleaf groundsel (*Senecio triangularis*) and brook saxifrage (*Saxifraga odontoloma*) have a combined cover of at least 5% and are usually abundant.
.....**Subalpine fir/Arrowleaf groundsel-brook saxifrage Association** (p.419)
8b. Not as above.....Go to 9

9a. Big huckleberry at least 5% cover.....
Subalpine fir/Big huckleberry Association
.....(see Johnson and Simon 1987; Johnson and Clausnitzer 1992)
9b. Not as above .....
.....Unclassified subalpine fir association or try **Key to Coniferous Associations** again

Key to Engelmann spruce Associations

1a. Microtopography on sites consists of obvious hummocks and swales with an height difference between hummock tops and swale bottoms of 30-100 cm. Most trees and shrubs are confined to hummocks. Hydrophytic (water-loving) grasses and sedges are confined mostly to swales.....Go to 2
1b. Sites and vegetation not as above. .....Go to 8

2a. Labrador tea (*Ledum glandulosum*) cover greater than 25%. .....Go to 3
2b. Labrador tea cover less than 25%. .....Go to 5

3a. Holm's sedge (*Carex scopulorum*) cover greater than 5%. .....Go to 4
3b. Holm's sedge scarce to absent.
.....**Subalpine fir/Labrador tea-grouse huckleberry Association** (p.414)

4a. Smooth-stemmed sedge (*Carex laeviculmis*) at least 5% cover. Common horsetail (*Equisetum arvense*) at least 25% cover.
..... **Engelmann spruce-subalpine fir/Labrador tea Swamp Association** (p.408)
4b. Smooth-stemmed sedge and common horsetail scarce to absent.
.....**Subalpine fir-Engelmann spruce/Labrador tea/Holm's sedge Association** (p.412)

5a. Bog blueberry (*Vaccinium uliginosum*) at least 5% cover. .....Go to 6
5b. Bog blueberry scarce to absent. .....Go to 8

6a. Holm's sedge (*Carex scopulorum*) or widefruit sedge (*Carex angustata*) at least 5% cover.....Go 7
6b. Holm's sedge or widefruit sedge scarce to absent.
..... **Engelmann spruce/Bog blueberry Association** (p.440)

7a. Holm's sedge at least 5% cover.
..... **Engelmann spruce-subalpine fir/Bog blueberry/Holm's sedge Association** (p.410)
7b. Widefruit sedge at least 5% cover.
.....**Engelmann spruce/Bog blueberry/Widefruit sedge Association** (p.442)

8a. Willows (*Salix* spp.), bog birch (*Betula nana*), bog blueberry, and/or Douglas' spiraea (*Spiraea douglasii*) dominate the shrub layer. Combined canopy cover of the shrubs at least 25%, and shrubs are not restricted to microsites.....Go to 9
8b. The above shrubs are subordinant to the herbaceous layer. Combined canopy cover of these shrubs is less than 25%.....Go to 12

9a. Bog blueberry at least 5% cover. Usually dominant but occasionally subordinant to willows, bog birch, or Douglas' spiraea. .....Go to 10
9b. Bog blueberry scarce to absent. Douglas' spiraea at least 5% cover and usually dominant but occasionally subordinant to willows. .....Go to 11

10a. Widefruit sedge at least 25% cover. Sites moist to wet.
.....**Engelmann spruce/Bog blueberry/Widefruit sedge Association** (p.442)
10b. Widefruit sedge scarce. Sites drier.
.....**Engelmann spruce/Bog blueberry Association** (p.440)

11a. Widefruit sedge at least 5% cover. Sites moist to wet.
.....**Lodgepole pine/Douglas spiraea/Widefruit sedge Association** (p.454)
11b. Widefruit sedge scarce. Sites drier.
.....**Lodgepole pine/Douglas spiraea Association** (p.451)

12a. Common horsetail (*Equisetum arvense*) or arrowleaf groundsel (*Senecio triangularis*) at least 25% cover. .....Go to 13
12b. Common horsetrail or arrowleaf groundsel less than 25% cover. .....Go to 14

13a. Common horsetail at least 25% cover, dominating the wet herbaceous undergrowth
.....**Engelmann spruce/Common horsetail Association** (p.428)
13b. Arrowleaf groundsel at least 25% cover
.....**Engelmann spruce/Arrowleaf groundsel Association** (p.425)

14a. Widefruit sedge or soft-leaved sedge (*Carex disperma*) at least 5% cover. .....Go to 15
14b. Widefruit sedge and soft-leaved sedge scarce to absent. .....Go to 16

15a. Soft-leaved sedge (*Carex disperma*) 5% cover, usually dominating the herbaceous layer. Sites wet.
.....**Engelmann spruce/Soft-leaved sedge Association** (p.531)

15b. Widefruit sedge at least 5% cover, usually dominating the herbaceous layer. Sites moist to wet. .....**Engelmann spruce/Widefruit sedge Association** (p.433)

16a. Ladyfern (*Athyrium filix-femina*) at least 5% cover.
.....**Engelmann spruce/Ladyfern Association** (p.423)
16b. Ladyfern scarce to absent.....Go to 17

17a. Columbia brome (*Bromus vulgaris*) at least 25% cover
.....**Engelmann spruce/Columbia brome Association** (p.436)
17b. Columbia brome less than 15% cover .....Go to 18

18a. Mountain alder (*Alnus incana*) and red-osier dogwood (*Cornus sericea* ssp. *sericea*) both present on sites with a combined cover of at least 25%.
.....**Engelmann spruce/Mountain alder-red-osier dogwood Association** (p.438)
18b. Not as above.....Go to 19

19a. Drooping woodreed (*Cinna latifolia*) at least 25% cover
.....**Engelmann spruce/Drooping woodreed Association** (p.435)
19b. Not as above .....Go to 20

20a. Ground cover herbaceous, dominated by mesic forbs such as queen's cup beadlily (*Clintonia uniflora*), sidebells pyrola (*Pyrola secunda*), white trillium (*Trillium ovatum*), sweet-scented bedstraw (*Galium triflorum*), and twistedstalks (*Streptopus* spp.).
.....**Engelmann spruce/Queen's cup beadlily Association** (See Kovalchik p.49)
20b. Not as above.....Go to 21

21a. Twinflower (*Linnaea borealis*) present and well-distributed throughout the stand with at least 1% cover
..... **Subalpine fir/Twinflower Association**
.....(see Johnson and Simon 1987;
..... Johnson and Clausnitzer 1992)

21b. Vegetation not as above
..... Unclassified Engelmann spruce Association
..... or try **Key to Coniferous Associations** again

Key to Grand Fir, White Fir and Western white pine Associations

1a. Ladyfern (*Athyrium filix-femina*) at least 5% cover ..... **Grand fir/Ladyfern Association** (p.363)
1b. Ladyfern scarce or absent .....Go to 2

2a. Oakfern (*Gymnocarpium dryopteris*) at least 5% cover
.....**Grand fir/Oakfern Association** (p.366)
2b. Oakfern scarce or absent.....Go to 3

3a. Swordfern (*Polystichum munitum*) and/or wild ginger (*Asarum caudatum*) present on site.
.....**Grand fir/Swordfern-wild ginger Association**
.....(see Johnson and Clausnitzer 1992)
3b. Swordfern and wild ginger absent from site.....Go to 4

4a. Rocky Mountain maple (*Acer glabrum*) at least 10% cover
.....**Grand fir/Rocky Mountain maple Association** (p.304)
4b. Rocky Mountain maple scarce to absent.....Go to 5

5a. False bugbane (*Trautvettaria caroliniensis*) at least 5% cover
..... **Grand fir/False bugbane Association** (p.369)
5b. False bugbane scarce or absent.....Go to 6

6a. Woolly sedge (*Carex pellita*) at least 25% cover
..... **Grand fir/Woolly sedge Association** (p.371)
6b. Woolly sedge absent .....Go to 7

7a. Pacific yew, present and well-distributed throughout the stand with at least 1% cover.
.....Go to 8
7b. Pacific yew less than 1% cover .....Go to 9

8a. Queen's cup beadlily (*Clintonia uniflora*) at least 5% cover
.....**Grand fir/Pacific yew/Queen's cup beadlily Association**
.....(see Johnson and Clausnitzer 1992)
8b. Queen's cup beadlily less than 5% cover. Twinflower (*Linnaea borealis*) present and well-distributed throughout the stand with at least 1% cover.
.....**Grand fir/Pacific yew/Twinflower Association**
.....(see Johnson and Clausnitzer 1992)

9a. Queen's cup beadlily present and well-distributed throughout the stand with 1% cover.
.....**Grand fir/Queen's cup beadlily Association**
.....(see Johnson and Simon 1987;
..... Johnson and Clausnitzer 1992)
9b. Queen's cup beadlily less than 1% cover .....Go to 10

10a. Twinflower present and well-distributed throughout the stand with at least 1% cover .....Go to 11
10b. Twinflower absent .....Go to 12

11a. Big huckleberry at least 5% cover ..... **Grand fir/Twinflower-big huckleberry Association** .....(see Johnson and Clausnitzer 1992)
11b. Big huckleberry less than 5% cover .....**Grand fir/Twinflower Association** .....(see Johnson and Simon 1987; ..... Johnson and Clausnitzer 1992)

12a. Common snowberry (*Symphoricarpos albus*) at least 25% cover .....**Grand fir/Common snowberry Association** (p.307)
12b. Common snowberry less than 25% cover.....Go to 13

13a. Western white pine (*Pinus monticola*) has at least 5% cover. Tufted hairgrass (*Deschampsia cespitosa*) at least 5% cover .....**Western white pine/Tufted hairgrass Association** (p.372)
13b. Western white pine less than 5% cover .....Go to 14

14a. White fir (*Abies concolor*) at least 5% cover. Ground cover herbaceous, dominated by mesic forbs such as queen's cup beadlily (*Clintonia uniflora*), sidebells pyrola (*Pyrola* secunda), white trillium (*Trillium* ovatum), sweet-scented bedstraw (*Galium triflorum*), and twistedstalks (*Streptopus* spp.). .....**White fir/Queen's cup beadlily Association** (See Kovalchik p.48)
14b. White fir less than 5% cover .....**Unclassified Grand fir or white fir Association** ..... or try **Key to Coniferous Associations** again

Key to Douglas fir Associations

1a. False bugbane (*Trautvettaria caroliniensis*) at least 5% cover .....**Douglas fir/False bugbane Association** (p.320)
1b. False bugbane scarce to absent.....Go to 2

2a. Water birch (*Betula occidentalis*) at least 5% cover .....**Douglas fir/Water birch Association** (p.313)
2b. Water birch absent .....Go to 3

3a. Black hawthorn (*Crataegus douglasii*) at least 5% cover .....**Douglas fir/Black hawthorn Association** (p.315)
3b. Black hawthorn less than 5% cover.....Go to 4

4a. Rocky Mountain maple (*Acer glabrum*) and/or mallow ninebark (*Physocarpus malvaceus*) combined cover at least 10% .....**Douglas fir/Rocky Mountain maple-mallow ninebark Association** (p.309)
4b. Rocky Mountain maple and mallow ninebark scarce to absent.....Go to 5

5a. Oceanspray (*Holodiscus discolor*) cover at least 5% .....**Douglas fir/Oceanspray Association** (p.312)
5b. Oceanspray scarce to absent .....Go to 6

6a. Common snowberry (*Symphoricarpos albus*) at least 5% cover .....**Douglas fir/Common snowberry Association** (p.317)
6b. Common snowberry scarce to absent ..... **Unclassified Douglas fir association** or try **Key to Coniferous Associations** again

Key to Ponderosa pine Associations

1a. Lodgepole pine cover at least 10%; Douglas' spiraea (*Spiraea douglasii*) and common snowberry (*Symphoricarpos albus*) cover at least 10%
.....**Ponderosa pine-lodgepole pine/Douglas' spiraea-**
.....**common snowberry Association** (p.373)
1b. Vegetation not as above.....Go to 2

2a. Common snowberry at least 5% cover. If common snowberry cover less than 5%, Wood's rose (*Rosa woodsii*) or common chokecherry (*Prunus virginiana*) cover at least 5%.....Go to 3
2b. Common snowberry and Wood's rose absent.
..... **Unclassified Ponderosa pine association**
..... or try **Key to Coniferous Associations** again

3a. Black hawthorn (*Crataegus douglasii*) at least 5% cover, usually the obviously dominant shrub forming a dense thicket with high canopy cover
.....**Ponderosa pine/Black hawthorn Association** (p.324)
3b. Black hawthorn scarce to absent
..... **Ponderosa pine/Common snowberry Association** (p.321)

Key to Deciduous Forest Associations

1a. Red alder (*Alnus rubra*) at least 5% cover..... Go to **Key to Red alder Associations** (p.35)
1b. Red alder scarce to absent.....Go to 2

2a. Quaking aspen (*Populus tremuloides*) at least 5% cover, generally dominating tree layers with at least 25% total cover
..... Go to **Key to Quaking Aspen Associations** (p.36)
2b. Quaking aspen scarce to absent .....Go to 2

3a. Black cottonwood (*Populus balsamerifera* spp. trichocarpa) at least 5% cover
..... Go to **Key to Black cottonwood Associations** (p.37)
3b. Black cottonwood scarce to absent.....Go to 4

4a. White alder (*Alnus rhombifolia*) at least 5% cover
.....Go to **Key to White alder Associations** (p.38)
4b. White alder scarce to absent .....Go to 5

5a. Narrowleaf cottonwood (*Populus angustifolia*) at least 5% cover
.....Go to **Key to Narrowleaf cottonwood Associations** (p.39)

5b. Narrowleaf cottonwood scarce to absent
..... **Unclassified deciduous association** or go back to **Key to Lifeform Groups**

Key to Red alder Associations

1a. Ladyfern (*Athyrium filix-femina*) at least 10% cover
.....**Red alder/Ladyfern Association** (p.377)
1b. Ladyfern less than 10% cover.....Go to 2

2a. Sweet coltsfoot (*Petasites frigidus* var. *palmatus*) at least 25% cover
..... **Red alder/Sweet coltsfoot Association** (p.379)
2b. Sweet coltsfoot less than 25% cover.....Go to 3

3a. Red-osier dogwood (*Cornus sericea* spp. *sericea*) at least 5% cover
.....**Red alder/Red-osier dogwood Association** (p.381)
3b. Red-osier dogwood scarce to absent.....Go to 4

4a. Pacific ninebark (*Physocarpus capitatus*) at least 10% cover
.....**Red alder/Pacific ninebark Association** (p.375)
4b. Pacific ninebark less than 10% cover .....Go to 5

5a. Common snowberry (*Symphoricarpos albus*) at least 5% cover
.....**Red alder/Common snowberry Association** (p.382)
5b. Vegetation not as above
..... **Unclassified red alder association** or try **Key to Deciduous Associations** again

Key to Quaking aspen Associations

1a. Douglas spiraea (*Spiraea douglasii*), or sometimes pyramid spiraea (*Spiraea pyrimidata*), at least 5% cover.....Go to 2
1b. Douglas spiraea absent .....Go to 3

2a. Widefruit sedge (*Carex angustata*) at least 5% cover
..... Quaking aspen-lodgepole pine/Douglas' spiraea/Widefruit sedge Association (p.392)
2b. Widefruit sedge scarce to absent
.....**Quaking aspen-lodgepole pine/Douglas' spiraea Association** (p.390)

3a. Aquatic sedge (*Carex aquatilis* var. *aquatilis*) at least 25% cover or the dominant graminoid.....**Quaking aspen/Aquatic sedge Association** (p.384)
3b. Aquatic sedge less than 25% cover.....Go to 4

4a. Woolly sedge (*Carex pellita*) at least 25% cover or the dominant graminoid
..... **Quaking aspen/Woolly sedge Association** (p.385)
4b. Woolly sedge less than 25% cover .....Go to 5

5a. Bluejoint reedgrass (*Calamagrostis canadensis*) at least 25% cover or the dominant graminoid.....**Quaking aspen/Bluejoint reedgrass Association** (p.388)
5b. Bluejoint reedgrass less than 25% cover .....Go to 6

6a. Water birch (*Betula occidentalis*) at least 5% cover
.....**Quaking aspen/Water birch Association** (p.398)
6b. Water birch absent .....Go to 7

7a. Mountain alder (*Alnus incana*) at least 25% cover
..... **Quaking aspen/Mountain alder Association** (p.395)
7b. Mountain alder less than 25% cover.....Go to 8

8a. Red-osier dogwood (*Cornus sericea* spp. *sericea*) at least 5% cover
..... **Quaking aspen/Red-osier dogwood Association** (p.395)
8b. Red-osier dogwood scarce to absent.....Go to 9

9a. Common chokecherry (*Prunus virginiana*) at least 5% cover
.....**Quaking aspen/Common chokecherry Association** (p.399)
9b. Common chokecherry scarce to absent .....Go to 10

10a. Lemmon willow (*Salix lemmonii*) at least 5% cover
.....Quaking aspen/Lemmon willow Association (p.397)
10b. Lemmon willow scarce to absent.....Go to 11

11a. Common snowberry (*Symphoricarpos albus*) usually at least 25% cover. On sites that are heavily browsed and grazed by livestock and/or elk and deer, common snowberry cover may be as low as 5-10% and Kentucky bluegrass and/or other species that increase with ground disturbance, such as California false-hellebore (*Veratrum californicum*), blue flag (*Iris missouriensis*), and awned sedge (*Carex athrostachya*). Also, on sites where quaking aspen clones are growing on sideslopes immediately surrounded by coniferous forest, vegetation may be succeeding to the adjacent coniferous association, and common snowberry cover may be as low as 10%.
.....**Quaking aspen/Common snowberry Association** (p.401)
11b. Common snowberry scarce to absent .....Go to 12

12a. Blue wildrye (*Elymus glaucus*) at least 5% cover.
..... **Quaking aspen/Blue wildrye Association** (p.404)
12b. Blue wildrye scarce to absent .....Go to 13

13a. Streambank buttercup (*Ranunculus uncinatus*), starry false-Solomon's seal (*Maianthemum stellata*), large-leaf avens (*Geum macrophyllum*) and northern bedstraw (*Galium* boreale) are the most constant forbs; forb species dominate the herbaceous layer.
..... **Quaking aspen/Streambank buttercup-large-leaf avens-starry false-**
..... **Solomon's seal Association**(p.406)
13b. Vegetation not as above
.....**Unclassifed quaking aspen association**
..... or try **Key to Deciduous Associations** again

Key to Black cottonwood Associations

1a. White alder (*Alnus rhombifolia*) has at least 10% cover
.....**Black cottonwood-white alder Association** (p.331)
1b. White alder has less than 10% cover .....Go to 2

2a. Water birch (*Betula occidentalis*) has at least 5% cover
.....**Black cottonwood/Water birch Association** (p.335)
2b. Water birch scarce to absent .....Go to 3

3a. Arroyo willow (*Salix lasiolepis*) at least 10% cover
.....**Black cottonwood/Arroyo willow Association** (p.327)
3b. Arroyo willow less than 10% cover.....Go to 4

4a. Shining willow (*Salix lucida*) at least 10% cover
.....**Black cottonwood/Shining willow Association** (p.328)
4b. Shining willow less than 10% cover.....Go to 5

5a. Mountain alder (*Alnus incana*) or red-osier dogwood (*Cornus sericea* spp. *sericea*) at least 25% cover or both species occur together on site and combined cover at least 15%.
..... **Black cottonwood/Mountain alder-red-osier dogwood Association** (p.339)
5b. Mountain alder and red-osier dogwood do not occur together on site, or if occurring singly, cover of each is less than 25%.....Go to 6

6a. Black hawthorn (*Crataegus douglasii*) at least 10% cover
.....**Black cottonwood/Black hawthorn Association** (p.337)
6b. Black hawthorn less than 10% cover.....Go to 7

7a. Vine maple (*Acer circinatum*) at least 10% cover
.....**Black cottonwood/Vine maple Associaton** (p.342)
7b. Vine maple less than 10% cover.....Go to 8

8a. Rocky Mountain maple (*Acer glabrum*) at least 10% cover or the dominant tall shrub
.....**Black cottonwood/Rocky Mountain maple Association** (p.343)
8b. Rocky Mountain maple less than 10% cover.....Go to 9

9a. Lewis' mockorange (*Philadelphus lewisii*) has at least 10% cover
.....**Black cottonwood/Lewis' mockorange Association** (p.333)
9b. Lewis' mockorange less than 10% cover .....Go to 10

10a. Common snowberry (*Symphoricarpos albus*) has at least 5% cover; if common snowberry absent, common chokecherry at least 10% cover.
.....**Black cottonwood/Common snowberry Association** (p.346)
10b. Common snowberry has less than 5% cover **AND** sites are alluvial bars or coarse fragment-rich alluvial fans or streambanks
…….**Black cottonwood – Alluvial Bar Association** (p.325)

Key to White alder Associations

1a. Torrent sedge (*Carex nudata*) at least 5% cover
..... **White alder/Torrent sedge Association** (p.353)
1b. Torrent sedge scarce to absent.....Go to 2

2a. Water birch (*Betula occidentalis*) at least 10% cover
..... **White alder/Water birch Association** (p.359)
2b. Water birch less than 10% cover..... o to 3

3a. Netleaf hackberry (*Celtis laevigata* var. *reticulata*) at least 10% cover
..... **White alder/Netleaf hackberry Association** (p.356)
3b. Netleaf hackberry less than 10% cover.....Go to 4

4a. Black hawthorn (Crataegus douglasii) at least 10% cover
.....**White alder/Black hawthorn Association** (p.360)
4b. Black hawthorn less than 10% cover.....Go to 5

5a. Vine maple (*Acer circinatum*) has at least 10% cover
.....**White alder/Vine maple Association** (p.361)
5b. Vine maple less than 10% cover.....Go to 6

6a. Red-osier dogwood (*Cornus sericea* spp. *sericea*) at least 10 % cover
..... **White alder/Red-osier dogwood Association** (p.357)
6b. Red-osier dogwood less than 10% cover.....Go to 7

7a. Lewis' mockorange (*Philadelphus lewisii*) at least 10% cover
.....**White alder/Lewis' mockorange Association** (p.354)
7b. Lewis' mockorange less than 10% cover
.....**White alder – Alluvial bar Association** (p.351)

Key to Narrowleaf cottonwood Associations

1a. Mountain alder (*Alnus incana*) has at least 25% cover
.....**Narrowleaf cottonwood/Mountain alder Association** (p.349)
1b. Not as above .....Go to 2

2a. Red-osier dogwood (*Cornus sericea* spp. *sericea*) at least 3% cover
.....**Narrowleaf cottonwood/Red-osier dogwood Association (**p.350)
2b. Not as above
.....**Unclassified narrowleaf cottonwood association**
..... or try **Key to Deciduous Associations** again

Key to Shrub Associations

1. Willows (*Salix* spp.) and/or bog birch (*Betula nana*) at least 25% cover or the dominant shrub.....
Go to **Key to Willow Associations** .....(p.40)

2. Bog blueberry, Labrador tea (*Ledum glandulosum*), alpine laurel (*Kalmia microphylla*) or red mountain-heath (*Phyllodoce empetriformis*), at least 25% cover or the dominant shrub
..... Go to **Key to Heath Associations** (p.43)

3. Mountain alder (*Alnus incana*), Sitka alder (*Alnus viridus* ssp. *sinuata*), alder-leaved buckthorn (*Rhamnus alnifolia*) or Douglas' spiraea (*Spiraea douglasii*) at least 25% cover
..... Go to **Key to Mountain alder, Sitka alder,Alder-leaved buckthorn**
.....**and Douglas' spiraea Associations** (p.44)

4. Water birch (*Betula occidentalis*) at least 15% cover or the dominant overstory shrub.
.....Go to **Key to Water birch Associations** (p.46)

5. Water birch absent. Red-osier dogwood (*Cornus sericea* spp. *sericea*) at least 25% cover.
..... Go to **Key to Red-osier dogwood Associations** (p.47)

6. Water birch absent. Black hawthorn (*Crataegus douglasii*), Lewis' mockorange (*Philadelphus* lewisii), Rocky Mountain maple (*Acer glabrum*), western serviceberry (*Amelanchior alnifolia*), common chokecherry (*Prunus virginiana*) or netleaf hackberry (*Celtis* laevigata var. reticulata) at least 25% cover or the dominant overstory shrub.
..... Go to **Key to Mixed Deciduous Shrubs Associations** (p.47)

7. Shrubby cinquefoil (*Potentilla fruticosai*), silver sagebrush (*Artemisia cana*) or mountain big sagebrush (*Artemisia tridentata* var. *vaseyana*) at least 25% cover or the dominant shrub.
.....Go to **Key to Shrubby cinquefoil and Sagebrush Associations** (p.48)

8a. Site with at least one of the following wetland attributes present: hydric soils, hydrophytic vegetation, wetland hydrology
..... **Unclassified Riparian or Wetland Shrub Association**

8b. Site with no wetland attributes present
.....**Upland Site**
.....refer to upland vegetation classifications:
..... Diaz et al. 1997, Hopkins 1979a and 1979b,
.....Hopkins and Kovalchik 1979, Johnson and Clausnitzer 1992,
.....Johnson and Simon 1987, Volland 1976

Key to Willow Associations

1a. Sites alpine to subalpine .....Go to 2
1b. Sites mid-montane and warmer .....Go to 12

2a. Arctic willow (*Salix arctica*) or Farr willow (*Salix farriae*) at least 25% cover, and the dominant shrub on site. .....Go to 3
2b. Arctic willow and Farr willow less than 25% cover. Undergreen willow (*Salix commutata*), Eastwood willow (*Salix eastwoodiae*), blueberry willow (*Salix ..... myrtillifolia*), booth willow (*Salix boothii*), bog birch (*Betula nana*) and/or Drummond's willow (*Salix drummondii*) at least 25% cover or the dominant overstory shrub(s). .....Go to 6

3a. Arctic willow at least 25% cover, or the dominant shrub. .....Go to 4
3b. Farr willow at least 25% cover or the dominant shrub. .....Go to 5

4a. Blueberry willow (*Salix myrtillifolia*) at least 25% cover, and few-flowered spikerush (*Eleocharis pauciflora*) dominant herbaceous species .....**Arctic willow-blueberry willow/Few-flowered spikerush Association** (p.269)

4b. Vegetation not as above; nearly black sedge (*Carex subnigricans*) the dominant herbaceous species .....**Arctic willow/Nearly black sedge Association** (p.268)

5a. Aquatic sedge (*Carex aquatilis* var. *aquatilis*) at least 25% cover .....**Farr willow/Aquatic sedge Association** (p.270)
5b. Not as above. Swamp onion (*Allium validum*) at least 25% cover ..... **Farr willow/Swamp onion Association** (p.271)

6a. Holm's sedge (*Carex scopulorum*) at least 25% cover or the dominant graminoid .....Go to 7
6b. Not as above.....Go to 8

7a. Undergreen, Eastwood and/or Drummond's willow dominant. Sites vary from steep floodplains to seeps to wet meadows. ..... **Undergreen willow-Eastwood willow/Holm's sedge Association** (p.251)
7b. Booth and/or blueberry willow dominant. Sites are low gradient floodplains and wet meadows..... ..... **Booth willow-blueberry willow/Holm's sedge Association** (p.253)

8a. Bladder sedge at least 25% cover or the dominant graminoid .....**Undergreen willow-Eastwood willow/Bladder sedge Association** (p.255)
8b. Not as above.....Go to 9

9a. Aquatic sedge (*Carex aquatilis* spp. *aquatilis*) at least 25% cover or the dominant graminoid ..... **Eastwood willow-Booth willow/Aquatic sedge Association** (p.254)
9b. Not as above .....Go to 10

10a. Bluejoint reedgrass at least 25% cover or the dominant graminoid .....**Booth willow-undergreen willow/Bluejoint reedgrass Association** (p.256)
10b. Tufted hairgrass (*Deschampsia cespitosa*) or black alpine sedge at least 25% cover or the dominant gramimoid .....Go to 11

11a. Tufted hairgrass at least 25% cover or the dominant graminoid .....**Booth willow/Tufted hairgrass Association** (p.257)
11b. Black alpine sedge (*Carex nigricans*) at least 25% cover or the dominant graminoid .....**Eastwood willow-blueberry willow/Black alpine sedge Association** (p.258)

12a. Dominant shrubs are: Booth willow (*Salix boothii*), Geyer willow (*Salix geyeriana*), Lemmon willow (*Salix lemmonii*), Bebb willow (*Salix bebbiana*), or bog birch (*Betula nana*), or occasionally shining willow (*Salix lasiandra*) or MacKenzie's willow (*Salix prolixa*). Most sites are meadows, low gradient floodplains, springs, seeps and slumps. Soils are often composed of fine-textured, coarse fragment-poor mineral materials or are organic. Soils may be saturated throughout the growing season and water tables are often high until at least early summer. .....Go to 13

12b. Dominant shrubs are: shining willow (*Salix lucida*), MacKenzie's willow (*Salix prolixa*), Lemmon willow (*Salix lemmonii*), coyote willow (*Salix exigua*), dusky willow (*Salix melanopsis*), arroyo willow (*Salix lasiolepis*) and/or Scouler willow(*Salix scouleriana*). Soils are often composed of gravel and cobble-rich mineral soils. Water tables are often low in the soil profile by early summer. .....Go to 22

13a. Bladder sedge (*Carex utriculata*) or, rarely, inflated sedge (*Carex vesicaria* var. *vesicaria*) at least 25% cover or the dominant gramimoid ..... **Booth willow-Geyer willow/Bladder sedge Association** (p.273)

13b. Not as above .....Go to 14

14a. Sitka sedge (*Carex aquatilis* var. *dives*) at least 25% cover or the dominant graminoid ..... **Geyer willow-Lemmon willow/Sitka sedge Association** (p.276)

14b. Not as above.....Go to 15

15a. Aquatic sedge (*Carex aquatilis* var. *aquatilis*) at least 25% cover or the dominant graminoid .....**Booth willow-Geyer willow/Aquatic sedge Association** (p.279)

15b. Not as above .....Go to 16

16a. Widefruit sedge (*Carex angustata*) at least 25% cover or the dominant graminoid ..... **Booth willow-Geyer willow/Widefruit sedge Association** (p.282)

16b. Not as above.....Go to 17

17a. Woolly sedge at least 25% cover or the dominant graminoid. On sites that have been highly disturbed by livestock grazing, woolly sedge at least 5% cover or the dominant native graminoid; introduced graminoids such as Kentucky bluegrass (*Poa pratensis*), creeping bentgrass (*Agrostis stolonifera*) and meadow foxtail (*Alopecurus pratensis*) are excluded in the graminoid cover. .....**Booth willow-Geyer willow/Woolly sedge Association** (p.284)

17b. Not as above .....Go to 18

18a. Bluejoint reedgrass (*Calamagrostis canadensis*) at least 25% cover or the dominant graminoid .....**Geyer willow/Bluejoint reedgrass Association** (p.272)

18b. Not as above.....Go to 19

19a. Tufted hairgrass (*Deschampsia cespitosa*) and Nebraska sedge (*Carex nebrascensis*) at least 25% cover or the dominant graminoids ..... **Geyer willow/Tufted hairgrass-Nebraska sedge Association** (p.287)

19b. Not as above .....Go to 20

20a. Baltic rush (*Juncus balticus*) at least 25% cover or the dominant graminoid .....**Geyer willow-Lemmon willow/Baltic rush Association** (p.288)

20b. Not as above.....Go to 21

21a. Mesic forbs and grasses, such as arrowleaf groundsel (*Senecio triangularis*), tall mannagrass (*Glyceria striata*), large-leaf avens (*Geum macrophyllum*), hairy willowherb (*Epilobium ciliatum*), sweet-scented bedstraw (*Galium triflorum*) and stinging nettle (*Urtica dioica*), dominate the herbaceous layer.
.....**Booth willow-Lemmon willow/Arrowleaf groundsel-large-leaf avens-**
..... **tall mannagrass Association** (p.289)

21b. Not as above .....
..... If site dominated by Booth willow, Geyer willow, Bebb willow
.....and/or bog birch try again starting at 13. Otherwise go to 22.

22a. Dusky willow (*Salix melanopsis*) at least 25% cover or the dominant shrub.
.....**Dusky willow Association** (p.247)

22b. Not as above.....Go to 23

23a. Arroyo willow at least 25% cover or the dominant willow. Red-osier dogwood (*Cornus sericea* spp. *sericea*) often present or even co-dominant on sites. Wood's rose (*Rosa woodsii*) also present at low to moderate cover
.....**Arroyo willow-red-osier dogwood-Wood's rose Association** (p.301)

23b. Not as above .....Go to 24

24a. Lemmon willow at least 25% cover or the dominant willow. Wood's rose and golden currant (*Ribes aureum*) often present in stands.
.....**Lemmon willow-Wood's rose Association** (p.302)

24b. Not as above.....Go to 25

25a. Shining willow (*Salix lucida* ssp. *lasiandra*) at least 25% cover or the dominant willow .....Go to 26

25b. Not as above .....Go to 28

26a. Nebraska sedge (*Carex nebrascensis*), creeping spikerush (*Eleocharis palustris*), Baltic rush (*Juncus balticus*), smallfruit bulrush (*Scirpus microcarpus*), woolly sedge (*Carex pellita*) and/or shortbeak sedge (*Carex simulata*) at least 25% cover.
.....**Shining willow/Nebraska sedge-creeping spikerush Association** (p.299)

26b. Not as above.....Go to 27

27a. Coyote willow at least 15% cover or co-dominant with shining willow.
.....**Coyote willow-shining willow-red-osier dogwood Association** (p.294)

27b. Not as above ..... **Shining willow Association** (p.297)

28a. Coyote willow at least 25% cover.....Go to 29

28b. Not as above.....Go to 32

29a. Red-osier dogwood at least 10% cover or shining willow at least 25% cover or co-dominant with coyote willow.
.....**Coyote willow-shining willow-red-osier dogwood Association** (p.294)

29b. Not as above .....Go to30

30a. Sheldon's sedge at least 25% cover
..... **Coyote willow/Sheldon's sedge Association** (p.303)

30b. Not as above.....Go to 31

31a. Creeping spikerush (Eleocharis palustris), three square bulrush (Schoenoplectus americanus), softstem bulrush (Schoenoplectus validus), hardstem bulrush (Schoenoplectus acutus), woolly sedge (Carex pellita) and/or common horsetail (Equisetum arvense) at least 10% cover singly or in combination.
..... **Coyote willow/Creeping spikerush-three square bulrush Association** (p.293)

31b. Creeping spikerush, three square bulrush, softstem bulrush, hardstem bulrush, woolly sedge and common horsetail sparse to absent. Herbaceous understory is generally sparse. Sites are sandy, gravelly and/or cobbly alluvial bars, streambanks or poorly-developed floodplains. ..... **Coyote willow – Alluvial bar Association** (p.291)

32a. MacKenzie's willow at least 25% cover or the dominant willow. Wood's rose often present to co-dominant in stands.
..... **MacKenzie's willow-Wood's rose Association** (p.296)

32b. Not as above..... Go to 33

33a. Scouler willow (*Salix scouleriana*) at least 25% cover or the dominant shrub.
..... **Scouler willow Association** (p.300)

33b. Not as above
..... Unclassified willow association or try **Key to Shrub Associations** again

Key to Heath Associations

1a. Bog blueberry together with dwarf forms of Booth, Eastwood, and undergreen willows (*Salix boothii, Salix eastwoodii, Salix commutata*) and/or Douglas' spiraea the dominant shrubs.
..... Go to 2

1b. Not as above ..... Go to 3

2a. Sitka sedge (*Carex aquatilis* var. *dives*) at least 25% cover (occasionally suppressed by dense shrub cover). ..... **Bog blueberry/Sitka sedge Association** (p. 262)

2b. Few-flowered spikerush (*Eleocharis quinqueflora*) at least 5% cover. Bog sites characterized by cold, water-saturated, poorly oxygenated, peat soils and high moss cover. Sites undulating. Low shrubs on hummocks.
..... **Bog blueberry/Few-flowered spikerush Association** (p.259)

3a. Labrador tea (*Ledum glandulosum*) at least 15% cover. Sites undulating. Low shrubs on hummocks. Holm's sedge (*Carex scopulorum*) and bluejoint reedgrass (*Calamagrostis canadensis*) in swales. ..... **Labrador tea/Holm's sedge Association** (p.267)

3b. Not as above ..... Go to 4

4a. Alpine laurel (*Kalmia microphylla*) at least 15% cover. Black alpine sedge (*Carex nigricans*) at least 5% cover..... **Alpine laurel/Black alpine sedge Association** (p. 264

4b. Not as above..... Go to 5

5a. Red mountain-heath (*Phyllodoce empetriformis*) at least 15% cover. Drummond's rush (*Juncus drummondii*) present.
..... **Red mountain-heath/Drummond's rush Association** (p.265)

5b. Not as above ..... **Unclassified heath association** or try **Key to Shrub Associations** again

Key to Mountain alder, Sitka alder, Alder-leaved buckthorn and Douglas' spiraea Associations

1a. Sitka alder at least 25% cover. ..... Go to 2
1b. Not as above ..... Go to 5

2a. Ladyfern (*Athyrium filix-feminai*) at least 5% cover ..... **Sitka alder/Ladyfern Association** (p.240)
2b. Ladyfern scarce to absent ..... Go to 3

3a. Common cowparsnip (*Heracleum lanatum*) at least 10% cover. ..... **Sitka alder/Common cowparsnip Association** (p.241)
3b. Common cowparsnip less than 10% cover. ..... Go to 4

4a. Drooping woodreed (*Cinna latifolia*) at least 5% cover ..... **Sitka alder/Drooping woodreed Association** (p.244)
4b. Not as above ..... Unclassified Sitka alder Association

5a. Mountain alder (or alder-leaved buckthorn (*Rhamnus alnifolia*)) at least 25% cover or the dominant overstory shrub. ..... Go to 6
5b. Not as above ..... Go to 25

6a. Alder-leaved buckthorn (*Rhamnus alnifolia*) at least 25% cover ..... **Alder-leaved buckthorn/Tall bluebells Association** (p.225)
6b. Not as above ..... Go to 7.

7a. Bigleaf sedge (*Carex amplifolia*) at least 25% cover or the dominant graminoid. ..... **Mountain alder/Bigleaf sedge Association** (p.193)
7b. Not as above ..... Go to 8

8a. Bladder sedge (*Carex utriculata*) or aquatic sedge (*Carex aquatilis* vat. *aquatilis*) at least 25% cover or the dominant graminoid ..... **Mountain alder/Bladder sedge Association** (p.199)
8b. Not as above ..... Go to 9

9a. Smallfruit bulrush (*Scirpus* microcarpus) at least 25% cover or the dominant graminoid ..... **Mountain alder/Smallfruit bulrush Association** (p.195)
9b. Not as above ..... Go to 10

10a. Bluejoint reedgrass (*Calamagrostis canadensis*) at least 25% cover or the dominant graminoid ..... **Mountain alder/Bluejoint reedgrass Association** (p.198)
10b. Not as above ..... Go to 11

11a. Water birch (*Betula occidentalis*) at least 5% cover. ..... **Mountain alder-water birch Association** (p.223)
11b. Not as above ..... Go to 12

12a. Woolly sedge (*Carex pellita*) at least 25% cover or the dominant graminoid ..... **Mountain alder/Woolly sedge Association** (p.197)
12b. Not as above ..... Go to 13

13a. Pacific ninebark (*Physocarpus capitatus*) at least 10% cover
.....**Mountain alder-Pacific ninebark Association** (p.219)
13b. Not as above .....Go to 14
14a. Douglas' spiraea at least 10% cover
.....**Mountain alder-Douglas' spiraea Association** (p.212)
14b. Not as above.....Go to 15

15a. Ladyfern (*Athyrium filix-femina*) at least 5% cover
.....**Mountain alder/Ladyfern Association** (p201)
15b. Ladyfern scarce or absent .....Go to 16

16a. Tall mannagrass (*Glyceria striata*), soft-leaved sedge (*Carex disperma*) or soft stemmed sedge (*Carex* laeviculmis) at least 15% cover or the dominant graminoid(s), not co-dominant with common horsetail (*Equisetum arvense*). Sites are floodplains and springs and often swampy with high moss cover. Streambanks are not included in this association.
..... **Mountain alder/Tall mannagrass Association** (p.206)
16b. Not as above.....Go to 17

17a. Red-osier dogwood at least 5% cover .....Go to 18
17b. Not as above .....Go to 19

18a. Lewis' mockorange (*Philadelphus lewisii*), sometimes together with black hawthorn (*Crataegus douglasii*) at least 10% cover
..... **Mountain alder-red-osier dogwood-Lewis' mockorange Association** (p.224)
18b. Lewis' mockorange or black hawthorn less than 10% cover
..... **Mountain alder-red osier dogwood Association** (p.217)

19a. Common horsetail at least 10% cover. Soils generally high in coarse fragments.
..... **Mountain alder/Common horsetail Association** (p.204)
19b. Not as above .....Go to 25

20a. Prickly and/or stinking swamp currant (*Ribes lacustre* and *Ribes hudsonianum*) at least 25% combined cover or the dominant understory shrubs
..... **Mountain alder-prickly currant-stinking swamp currant Association** (p.214)
20b. Not as above.....Go to 21

21a. Oakfern (*Gymnocarpium dryopteris*) at least 10% cover
..... **Mountain alder/Oakfern Association** (p.209)
21b. Not as above .....Go to 22

22a. Common cowparsnip at least 5% cover or the dominant tall forb
..... **Mountain alder/Common cowparsnip Association** (p.210)
22b. Not as above.....Go to 23

23a. Common snowberry (*Symphoricarpos albus*) at least 5% cover
.....**Mountain alder-common snowberry Association** (p.220)
23b. Common snowberry sparse to absent .....Go to 24

24a. Mesic forbs, such as sweet-scented bedstraw (*Galium triflorum*), hairy willowherb (*Epilobium ciliatum*), monkeyflowers (*Mimulus* spp.), arrowleaf groundsel (*Senecio triangularis*), Columbia monkshood (*Aconitum columbianum*), enchanter's nightshade (*Circaea alpina*), Solomon's seal and Solomonplume (*Smilacina* spp.), mitreworts (*Mitella* spp.), streambank buttercup (*Ranunculus uncinatus*), large mountain bittercreww (*Cardamine cordifolia*), and Dewey's sedge (*Carex deweyana*), at least 5% cover. A wide variety of herbaceous species area usually present in small amounts of cover, creating a heterogenous herbaceous carpet under the generally dense alder canopy.
..... **Mountain alder/Sweet-scented bedstraw-hairy willowherb-**
..... **arrowleaf groundsel-starry false-Solomon's seal Association** (p.211)

24b. ..... Unclassified Mountain alder association

25a. Prickly and/or stinking swamp currant (*Ribes lacustre* and *Ribes hudsonianum*) at least 15% combined cover cover .....Go to 26

25b. Not as above .....Go to 28

26a. Drooping woodreed (*Cinna latifolia*) at least 5% cover; drooping woodreed has greater cover than tall mannagrass (*Glyceria striata*)
..... **Prickly currant-stinking swamp currant/Drooping woodreed Association** (p.89)

26b. Not as above.....Go to 27

27a. Tall mannagrass and/or a mix of mesic forbs, such as sweet-scented bedstraw (*Galium trifolium*), claspleaf twistedstalk (*Streptopus amplexifolius*), enchanter's nightshade (*Circaea alpina*), Columbia monkshood (*Aconitum columbianum*), alpine mitrewort (*Mitella pentandra*), brook saxifrage (*Saxifraga arguta*), pathfinder (*Adenocaulon bicolor*), arrowleaf groundsel (*Senecio triangularis*) and baneberry (*Adenocaulon bicolor*) comprise the herbaceous understory
..... **Prickly currant-stinking swamp currant/Tall mannagrass Association** (p.191)

27b. Not as above .....Go to 28

28a. Douglas' spiraea (*Spiraea douglasii*) at least 25% cover
.....**Douglas' spiraea Association** (p.228)

28b. Not as above
.....**Undescribed Sitka alder, mountain alder, currants or**
..... **Douglas' spiraea association** or try **Key to Shrub Associations** again

Key to Water birch Associations

1a. Mix of the following shrubs, blue elderberry (*Sambucus cerulea*),black hawthorn (*Crataegus douglasii*), Lewis' mockorange (*Philadelphus lewisii*), mallow ninebark (*Physocarpus malvaceus*), western serviceberry (*Amelanchior alnifolia*), Rocky Mountain maple (*Acer glabrum*), oceanspray (*Holodiscus discolor*) and common chokecherry (*Prunus virginiana*) with a combined cover of at least 20%.
.....**Water birch-Lewis' mockorange-western serviceberry-**
.....**common snowberry Association** (p.175)

1a. Not as above; blue elderberry, mallow ninebark, oceanspray, Rocky Mountain maple, black hawthorn and common chokecherry scarce to absent.....Go to 2

2a. Lewis' mockorange the dominant shrub with at least 10% cover, sometimes co-dominant with red-osier dogwood. .....
..... **Water birch/Lewis' mockorange Association** (p.174)

2b. Not as above
..... **Unclassified water birch association** or try **Key to Shrub Associations** again

Key to Red-osier dogwood Associations

1a. Brook saxifrage (*Saxifraga arguta*) at least 25% cover.
.....**Red-osier dogwood/Brook saxifrage Association** (p.226)
1b. Not as above .....Go to 2

2a. Thimbleberry (*Rubus parviflora*) at least 25% cover.
.....**Red-osier dogwood-thimbleberry Association** (p.167)
2b. Not as above.....Go to 3

3a. Rocky Mountain maple (*Acer glabrum*) at least 10% cover
..... **Red-osier dogwood-Rocky Mountain maple Association** (p.169)
3b. Not as above .....Go to 4

4a. Lewis' mockorange at least 10% cover. Willows (*Salix* spp.) scarce to absent
..... **Red-osier dogwood-Lewis' mockorange Association** (p.171)
4b. Not as above.....Go to 5

5a. Common chokecherry (*Prunus virginiana*) at least 10% cover. Willows often present to abundant.
.....**Red-osier dogwood-common chokecherry Association** (p.172)
5b. Not as above .....**Red-osier dogwood Association** (p.165)

Key to Mixed Deciduous Shrubs Associations

1a. Netleaf hackberry (*Celtis laevigata* ssp. *reticulata*) at least 10% cover. Lewis' mockorange (*Philadelphis lewisii*) at least 5% cover.
.....**Netleaf hackberry-Lewis' mockorange Association** (p.187)
1a. Netleaf hackberry less than 10% cover.....Go to 2

2a. Black hawthorn (*Crataegus douglasii*) at least 25% cover .....Go to 3
2b. Black hawthorn less than 25% cover.....Go to 7

3a. Alder-leaved buckthorn (*Rhamnus alnifolia*) at least 25% cover
.....**Black hawthorn-Alder-leaved buckthorn Association** (p.177)
3b. Not as above .....Go to 4

4a. Mix of the following shrubs, Lewis' mockorange (*Philadelphus lewisii*), mallow ninebark (*Physocarpus malvaceus*), western serviceberry (*Amelanchior alnifolia*), Rocky Mountain maple (*Acer glabrum*), oceanspray (*Holodiscus discolor*) and common chokecherry (*Prunus virginiana*) with a combined cover of at least 20%.
.....**Black hawthorn-Lewis' mockorange-Rocky Mountain maple-**
.....**common chokecherry Association** (p.182)
4b. Not as above.....Go to 5

5a. Common snowberry (*Symphoricarpos albus*) at least 15% cover. Poor condition sites may have lower cover..... **Black hawthorn/Common snowberry Association** (p.180)
5b. Not as above .....Go to 6

6a. Wood's rose (*Rosa woodsii*) at present.
.....**Black hawthorn-Wood's rose Association** (p.179)
6b. Not as above .....Go to 7

7a. Lewis' mockorange at least 25% cover or the dominant shrub
..... **Lewis' mockorange Association** (p.186)
7b. Not as above .....Go to 8

8a. Rocky Mountain maple, western serviceberry and/or common chokecherry at least 25% cover, separately or in combination
..... **Rocky Mountain maple-western serviceberry-**
.....**common chokecherry Association** (p.184)
8b. Not as above
.....**Unclassified mixed deciduous shrub association**
..... or try **Key to Shrub Associations** again

Key to Shrubby cinquefoil and Sagebrush Associations

1a. Shrubby cinquefoil at least 25% cover or the dominant shrub .....Go to 2
1b. Not as above. .....Go to 3

2a. Sites alpine. Bog birch (*Betula nana*) cover at least 25%. Simple bog sedge (*Kobresia simpliciuscula*) and alpine meadowrue (*Thalictrum alpinum*) also present with at least 10% cover each. Miscellaneous community found in Francis Lake Basin in Wallowa Mountains in northeastern Oregon .....
..**Bog birch-shrubby cinquefoil/Simple bog sedge-alpine meadowrue Community** (p.271)
2b. Sites not as above.....**Shrubby cinquefoil Association** (p.229)

3a. Silver sagebrush at least 25% cover or the dominant shrub .....Go to 5
3b. Not as above .....Go to 4

4a. Mountain big sagebrush at least 25% cover or the dominant shrub; Cusick's bluegrass (*Poa cusickii*) at least 5% cover
..... **Mountain big sagebrush/Cusick's bluegrass Association** (p.236)
4b. Not as above.....Unclassified big sagebrush association
.....refer to upland vegetation classifications:
..... Diaz et al. 1997, Hopkins 1979a and 1979b,
.....Hopkins and Kovalchik 1979, Johnson and Clausnitzer 1992,
.....Johnson and Simon 1987, Volland 1976

5a. Tufted hairgrass (*Deschampsia cespitosa*) at least 25% cover or the dominant graminoid
.....**Silver sagebrush/Tufted hairgrass Association** (p.232)
5b. Not as above .....Go to 6

6a. Cusick's bluegrass (*Poa cusickii*) at least 5% cover or the dominant graminoid
..... **Silver sagebrush/Cusick's bluegrass Association** (p.234)
6b. Not as above..... Unclassified Silver sagebrush Association

Key to Graminoid Associations

NOTE: Some sites that are identified as herbaceous types in the field may be early- to mid-seral shrub types. To decide whether you are in an early- to mid-seral shrub type, look for the following site characteristics:

a. shrub seedlings successfully growing within the herbaceous vegetation and at a cover of at least 10% on the site.

b. an adjacent stream (if present) that has pool-riffle or step pool morphology and has a gradient of at least 0.5% and has material, generally sand, gravel and/or cobble, aggrading adjacent to the streambanks and/or along the insides of meander curves (i.e. at point bars).

1a. Brewer's sedge (*Carex breweri*) at least 25% cover. Tufted hairgrass (*Deschampsia cespitosa*), black alpine sedge (*Carex nigricans*) and Holm's sedge (*Carex scopulorum*) scarce to absent ..... **Brewer's sedge Association** (p.87)

1b. Vegetation not as above ..... Go to 2

2a. Hare sedge (*Carex leporinella*) at least 25% cover or the dominant graminoid. Sites old oxbows in high elevation, very low gradient, generally wide valleys containing Rosgen C or E type streams. ..... **Hare sedge Association** (p.100)

2b. Hare sedge less than 25% cover ..... Go to 3

3a. Green-fruited sedge (*Carex interrupta*) at least 25% cover or the dominant graminoid. ..... **Green-fruited sedge Association** (p.94)

3b. Vegetation not as above ..... Go to 4

4a. Star sedge (*Carex echinata*) at least 25% cover ..... **Star sedge Association** (p.93)

4b. Star sedge less than 25% cover ..... Go to 5

5a. Bog sites characterized by cold, water-saturated, peat soils (some soils are classified as mineral but have an organic surface horizon) and high moss cover. Where this association occurs in obvious shallow water paths in wet meadows, soils are occasionally rarely fine-textured mineral soils with obvious hydric feature. Moss cover may also be low in these water paths. Few-flowered spikerush (*Eleocharis quinqueflora*) at least 5% cover, but often dominating vegetation with 60-90% cover. Primrose monkeyflower (*Mimulus primuloides*), , elephant's head (*Pedicularis groenlandica*), ladies tresses (*Spiranthes romanzoffiana*), bog saxifrage (*Saxifraga* oregana), shooting stars (*Dodecatheon* spp.) and common horsetail are often present. Holm's sedge, woodrush sedge (*Carex luzulina*), star sedge (*Carex echinata*), sheep sedge (*Carex illota*) and Jones' sedge (*Carex jonesii*) occasionally forms patches, generally on very slightly elevated microhummocks within the site. Normally robust sedges such as Sitka, aquatic and bladder sedge are dwarfed and scattered. ..... **Few-flowered spikerush Association** (p.126)

5b. Sites and vegetation not as above ..... Go to 6

6a. Creeping spikerush at least 25% cover or the dominant graminoid within grand fir (*Abies grandis*), white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*) and Ponderosa pine (*Pinus ponderosa*) upland vegetation zones ..... **Creeping spikerush – Perennial Stream/Pond Association** (p.66)

6b. Not as above ..... Go to 7

7a. Bladder sedge (*Carex utriculata*) at least 25% cover or the dominant graminoid ..... **Bladder sedge Association** (p.120)

7b. Not as above ..... Go to 8

8a. Showy sedge (*Carex spectabilis*) at least 25% or the dominant graminoid, and subalpine lupine (*Lupinus articus* ssp.*subalpinus* = *L. latifolius*) at least 25% cover. .....**Showy sedge-subalpine lupine Association** (p.119)
8b. Vegetation not as above .....Go to 9

9a. Holm's sedge (*Carex scopulorum*) at least 25% cover or the dominant graminoid. Sheep sedge (*Carex illota*) sometimes co-dominant. .....**Holm's sedge Association** (p.112)
9b. Not as above .....Go to 10

10a. Black alpine sedge (*Carex nigricans*) 25% or the dominant graminoid .....**Black alpine sedge Association** (p.106)
10b. Not as above.....Go to 11

11a. Black alpine sedge and/or Holm's sedge co-dominant with tufted hairgrass (*Deschampsia cespitosa*). .....**Holm's sedge-black alpine sedge-tufted hairgrass Association** (p.114)
11b. Vegetation not as above.....Go to 12

12a. Woodrush sedge (*Carex luzulina*) 25% cover or the dominant graminoid ..... **Woodrush sedge Association** (p.101)
12b. Not as above.....Go to 13

13a. Cusick's sedge (*Carex cusickii*) at least 25% cover or the dominant graminoid .....**Cusick's sedge Association** (p.91)
13b. Not as above .....Go to 14

14a. Aquatic sedge (*Carex aquatilis* var. *aquatilis*) at least 25% cover or the dominant graminoid .....**Aquatic sedge Association** (p.81)
14b. Not as above.....Go to 15

15a. Gray sedge (*Carex canescens*) at least 25% cover or the dominant graminoid ..... **Gray sedge Association** (p.90)
15b. Not as above .....Go to 16

16a. Inflated sedge (*Carex vesicaria* var. *vesicaria*) at least 25% cover or the dominant graminoid .....**Inflated sedge Association** (p.123)
16b. Not as above.....Go to 17

17a. Sitka sedge (*Carex aquatilis* var. *dives*) at least 25% cover or the dominant graminoid..... **Sitka sedge Association** (p.84)
17b. Not as above .....Go to 18

18a. Wideleaf sedge (*Carex amplifolia*) at least 25% cover or the dominant graminoid .....**Wideleaf sedge Association** (p.77)
18b. Not as above.....Go to 19

19a. Sawbeak sedge (*Carex stipata*) at least 25% cover or the dominant graminoid .....**Sawbeak sedge Association** (p.119)
19b. Not as above .....Go to 20

20a. Smallfruit bulrush (*Scirpus microcarpus*) at least 25% cover or the dominant graminoid .....**Smallfruit bulrush Association** (p.134)
20b. Not as above.....Go to 22

21a. Slender sedge (*Carex lasiocarpa*) at least 25% cover or the dominant graminoid ..... **Slender sedge Association** (p.96)
21b. Not as above .....Go to 23

22a. Buxbaum's sedge (*Carex buxbaumii*) at least 25% cover or the dominant graminoid .....**Buxbaum's sedge Association** (p.89)
22b. Not as above.....Go to 23

23a. Short-beak sedge (*Carex simulata*) at least 25% cover or the dominant graminoid ..... **Short-beak sedge Association** (p.117)

23b. Not as above .....Go to 24

24a. Widefruit sedge (*Carex angustata*) at least 25% cover or the dominant graminoid ..... **Widefruit sedge Association** (p.79)
24b. Not as above.....Go to 25

25a. Tall mannagrass (*Glyceria elata* includes *G. striata*) at least 25% cover or the dominant graminoid.....**Tall mannagrass Association** (p.147)
25b. Not as above .....Go to 26

26a. Smooth-stemmed sedge (*Carex laeviculmis*) at least 25% cover or the dominant graminoid .....**Smooth-stemmed sedge Association** (p.95)
26b. Not as above.....Go to 27

27a. Densely-tufted sedge (*Carex lenticularis* var. *lenticularis*) at least 25% cover or the dominant graminoid..... **Densely-tufted sedge Association** (p.98)
27b. Not as above .....Go to 28

28a. Woolly sedge (*Carex pellita*) at least 25% cover or the dominant graminoid ..... **Woolly sedge Association** (p.109)

28b. Not as above.....Go to 29

29a. Sheldon's sedge (*Carex sheldonii*) at least 25% cover or the dominant graminoid .....**Sheldon's sedge Association** (p.116)
29b. Not as above .....Go to 30

30a. Bluejoint reedgrass (*Calamagrostis canadensis*) or other reedgrass species at least 25% cover or the dominant graminoid..... **Bluejoint reedgrass Association** (p.138)
30b. Not as above.....Go to 31

31a. Nebraska sedge (*Carex nebrascensis*) at least 25% cover or the dominant graminoid .....**Nebraska sedge Association** (p.103)
31b. Not as above .....Go to 32

32a. Nevada rush (*Juncus nevadensis*) at least 25% cover or the dominant graminoid .....**Nevada rush Association** (p.131)
32b. Not as above .....Go to 33

33a. Three-square bulrush (*Scirpus americanus*) at least 25% cover or the dominant graminoid ..... **Three-square bulrush Association** (p.133)
33b. Not as above .....Go to 34

34a. Creeping spikerush at least 25% cover or the dominant graminoid in western juniper (*Juniperus occidentalis*) and sagebrush (*Artemisia* spp.) upland vegetation zones. ..... **Creeping spikerush – Perennial Stream/Pond Association** (p.66)
34b. Not as above.....Go to 35

35a. Torrent sedge (*Carex nudata*) at least 25% cover or the dominant graminoid
.....**Torrent sedge Association** (p.108)
35b. Not as above .....Go to 36

36a. Tufted hairgrass (*Deschampsia cespitosa*) at least 25% cover or the dominant graminoid .....Go to 37
36b. Not as above.....Go to 41

37a. Aquatic sedge at least 15% cover
.....**Tufted hairgrass-aquatic sedge Association** (p.142)
37b. Not as above.....Go to 38

38a. Timber oatgrass (*Danthonia intermedia*) at least 10% cover
.....**Tufted hairgrass-timber oatgrass Association** (p.144)
38b. Not as above .....Go to 39

39a. Nebraska sedge or Baltic rush (*Juncus balticus*) at least 15% cover .....Go to 40
39b. Not as above.....**Tufted hairgrass Association** (p.139)

40a. Nebraska sedge dominant over Baltic rush
.....**Tufted hairgrass-Nebraska sedge Association** (p.143)
40b. Baltic rush dominant over Nebraska sedge
.....**Tufted hairgrass-Baltic rush Association** (p.145)

41a. Baltic rush at least 25% cover or the dominant graminoid
.....**Baltic rush Association** (p.129)
41b. Not as above .....Go to 42

42a. Great Basin wildrye at least 25% cover or the dominant graminoid
..... **Great Basin wildrye Association** (p.151)
42b. Not as above.....Go to 43

43a. Cusick's bluegrass at least 25% cover or the dominant graminoid
.....**Cusick's bluegrass Association** (p.149)
43b. Not as above .....Go to 44

44a. Blue wildrye at least 25% cover or the dominant graminoid
.....**Blue wildrye Association** (p.146)
44b. Not as above.....Go to 45

45a. Thin bentgrass (*Agrostis pallens*) at least 25% or the dominant graminoid
.....**Thin bentgrass Association** (p.137)
45b. Not as above
.....**Unclassified graminoid association**
..... or try **Key to Graminoid Associations** again

Key to Forb Associations

1a. Sites are surrounded by alpine or subalpine upland vegetation, which is dominated by subalpine fir (*Abies lasiocarpa*) and/or mountain hemlock (*Tsuga mertensiana*) .....Go to 2
1b. Sites not as above; surrounding upland vegetation is mid-montane forest, western juniper (*Juniperus occidentalis*), sagebrush (*Artemisia* spp.), bunchgrass or hardwood shrubland. .....Go to 10

2a. Swamp onion (*Allium validum*) at least 25% cover.....Go to 3
2b. Not as above.....Go to 4

3a. Holm's sedge at least 25% cover..... **Swamp onion-Holm's sedge Association** (p.155)
3b. Holm's sedge less than 25% cover ..... **Swamp onion Association** (p.153)

4a. Ladyfern (*Athyrium filix-femina*) at least 5% cover.....**Ladyfern Association** (p.156)
4b. Ladyfern scarce to absent.....Go to 5

5a. Arrowleaf groundsel (*Senecio triangularis*) at least 5% cover.....Go to 6
5b. Sites not as above.....Go to 7

6a. A combination of arrowleaf groundsel, Lewis' monkeyflower (*Mimulus lewisii*), common cowparsnip (*Heracleum lanatum*), western larkspur (*Delphinium occidentale*), subalpine daisy (*Erigeron peregrinus* ssp. *callianthemus*), tall bluebells (*Mertensia paniculata*), California false-hellebore (*Veratrum californicum*) and/or broadleaf bluebells (*Mertensia ciliata*) are the dominant tall forbs. Soils are rocky. ..... **Arrowleaf groundsel mixed subalpine forb Association** (p.160)

6b. Vegetation not as above. Arrowleaf groundsel usually the dominant tall forb on the site; Lewis' monkeyflower sometime the co-dominant tall forb. Arrowleaf groundsel not subordinate to brook saxifrage (Saxifraga arguta). Where arrowleaf groundsel forms a near monoculture, soils are generally very gravel- and cobble-rich. ..... **Arrowleaf groundsel Association** (p.162)

7a. Brook saxifrage at least 15% cover and usually the dominant forb on the sites; not subdominant to arrowleaf groundsel. ..... **Brook saxifrage Association** (p.161)
7b. Brook saxifrage scarce to absent .....Go to 8

8a. California false hellebore at least 10% cover .....**California false hellebore Association** (p.164)
8b. Not as above.....Go to 9

9a. Prairie sage (*Artemisia ludoviciana*) at least 25% cover. Site rocky levees or alluvial bars. ..... **Prairie sage Association** (p.157)
9b. Sites and vegetation not as above ..... **Unclassified alpine/subalpine forb association**

10a. Sites wet bogs. Bog buckbean at least 25% cover or the dominant forb. ..... **Bog buckbean Association** (p.61)
10b. Sites and vegetation not as above .....Go to 11

11a. Maidenhair fern (*Adiantum pedatum*) at least 25% cover or the dominant forb ..... **Maidenhair fern Association** (p.152)
11b. Not as above .....Go to 12

12a. Ladyfern (*Athyrium filix-femina*) at least 5% cover.....**Ladyfern Association** (p.156)
12b. Ladyfern scarce or absent .....Go to 13

13a. Arrowleaf groundsel (*Senecio triangularis*) at least 5% and clearly dominant over (not co-dominant with) brook saxifrage (*Saxifraga arguta*)
.....**Arrowleaf groundsel Association** (p.162)
13b. Not as above .....Go to 14

14a. Brook saxifrage at least 5% cover..... **Brook saxifrage Association** (p.161)
14b. Not as above.....Go to 15

15a. Common horsetail (*Equisetum arvense*) at least 25% cover or the dominant forb
.....**Common horsetail Association** (p.159)
15b. Not as above .....Go to 16

16a. American speedwell (*Veronica americana*) at least 25% cover
..... **American speedwell Association** (p.63)
16b. Not as above.....Go to 17

17a. Cusick's camas (*Camassia cusickii*) at least 15% cover; generally the dominant forb. This association is found on seep slopes in the eastern Blue Mountains.
..... **Cusick's camas Association** (p.158)
17b. Not as above .....Go to 18

18a. Prairie sage (*Artemisia ludoviciana*) at least 25% cover. Sites are generally rocky alluvial bars or streambeds of ephemeral or intermittent streams.
..... **Prairie sage Association** (p.157)
18b. Not as above.....Unclassified forb association or
.....try **Key to Forb Associations** again

AQUATIC ASSOCIATIONS

Much of the following information is taken from Kovalchik's (2001) riparian classification and guide for National Forest lands in eastern Washington. Kovalchik described the relationship among the site characteristics of the aquatic associations that he classified. The eastern Washington associations that are equivalent to associations classified here for eastern Oregon are: Creeping spike rush (*Eleocharis palustris*) Association (equivalent to the ELPA stream/pond Association), Northern mannagrass (*Glyceria borealis*) Association, Pond lily (*Nuphar*) spp. Association, Burreed (*Sparganium* spp.) Association, Common cattail (*Typha latifolia*) Association, Pondweed (*Potamogeton* spp.) Association, and Softstem bulrush (*Schoenoplectus tabernaemontani*) Association (which includes hardstem bulrush (*Schoenoplectus acutus* var. *acutus*)).

General characteristics about the dominant species in these aquatic associations are described below (Hitchcock and Cronquist 1973):

1. Rocky Mountain pondlily (*Nuphar lutea* ssp. *polysepala*) are found in deep standing water and occur in western North America. It are found throughout the Pacific Northwest.
2. Pondweeds (*Potamogeton* spp.) are plants found in moderately deep standing water. Grass-leaved pondweed (*Potamogeton gramineus*) and floating pondweed (*P. natans*) are found from Alaska south on both sides of the Cascade Mountains to California, Arizona and Colorado and east through most of central and northeast United States and southeast Canada. They occur throughout the Pacific Northwest.
3. Burreeds (*Sparganium* spp.) are plants of shallow standing water. They are found from Alaska south through the Pacific Northwest Region and east to Newfoundland and the northeast states and occur throughout the Pacific Northwest.
4. Softstem bulrush (*Schoenoplectus tabernaemontani*) and Hardstem bulrush (*S. acutus* var. *acutus*) are plants of marshes and muddy shores that are widespread in temperate North America. *S. tabernaemontani* extends south into tropical America. *S. acutus* var. *acutus* is commonest in the western United States. They both occur throughout the Pacific Northwest, but *S. acutus* var. *acutus* is more common in brackish or alkaline waters along the coast and east of the Cascade Range.
5. Common cattail (*Typha latifolia*) is a species of shallow standing water and wet places that occurs from Alaska to Mexico and east through most of southern Canada and throughout the United States. It is found throughout the Pacific Northwest.
6. Northern mannagrass (*Glyceria borealis*) is found in shallow standing water and occurs from Alaska to central California and east to Newfoundland, Maine and Pennsylvania. It occurs throughout the Pacific Northwest.
7. Creeping spikerush (*Eleocharis palustris*) is found in shallowly flooded water and shorelines and is widespread in temperate and cold-temperature regions of the Northern Hemisphere. It occurs in the Pacific Northwest.

Kovalchik (2001) described the aquatic associations as "herbaceous associations supporting rooted vascular or emergent vegetation that are growing in deep water or in shallow water along the shoreline of permanently standing water". The sites "include natural ponds and lakes, seasonally flooded shorelines, beaver ponds, reservoirs, sloughs, or the quiet backwaters of [Rosgen] E and C channels". These E and C stream reach types (Rosgen 1996) have low gradient, highly sinuous stream and river channels, and they frequently form oxbows and overflow channels.

The most important factor determining the distribution of aquatic plant associations relative to each other is water depth. Secondary factors are wave action , water temperature, oxygenation and chemistry. The transition from deep to shallow water and shoreline is probably more important to the distribution of aquatic plant associations in lakes and ponds than the size of the water body and wave action.

Kovalchik found that the distribution of associations from deeper to shallower water in ponds and lakes generally follows this sequence: Rocky Mountain pondlily (*Nuphar lutea* ssp. *polysepala*), pondweed (*Potamogeton* spp.) and burreed (*Sparganium* spp.), bulrush (*Schoenoplectus*) spp., and then creeping spikerush (*Eleocharis palustris*) and Northern mannagrass (*Glyceria borealis*) along the margins. Common cattail (*Typha latifolia*) may dominate if the shallow shoreline water is poorly oxygenated. The transition from one association to another may be different than this sequence if there are abrupt changes in water depth. Aquatic associations sampled in eastern Oregon show a distribution of associations from deeper to shallower water that is

similar to Kovalchik's sequence. The associations listed below are in the following sequence: *Nuphar lutea* ssp. *polysepala*, *Potamogeton* spp,. Needle spikerush (*Eleocharis acicularis*), Narrow-leaf burreed (*Sparganium angustifolium*), Canadian waterweed (*Elodea canadensis*), and in the shallow water, shoreline zone, any of the following: *Schoenoplectus acutus* var. *acutus/ tabernaemontani*, *Glyceria borealis*, *Typha latifolia*, *Eleocharis palustris*, Delicate spikerush (*Eleocharis bella*), Watercress (*Rorippa nasturtium-aquaticum*), Weak alkaligrass (*Torreyochloa pallida* var. *pauciflora*). Bog buckbean (*Menyanthes trifoliata*) may be emergent or found on an organic-rich floating mat or shore adjacent to a lake or pond. White water buttercup (*Ranunculus aquatilis*) is most commonly seen in stock ponds or other water, de-oxygenated bodies of water.

Aquatic associations found in slow-moving or slackwater sections of streams (Rosgen C, E and occasionally F streams)in eastern Oregon were: Vernal waterstarwort (*Callitriche palustris*), *Potamogeton natans*, *Ranunculus aquatilis*, *Rorippa nasturtium-aquaticum*, *Sparganium angustifolium*, *Typha latifolia*, *Torreyochloa pallida* var. *pauciflora*, *Eleocharis palustris*. The American speedwell (*Veronica americana*) Association was found only in streams and springs and is associated with extremely shallow (generally 5-10 cm water depth), gentle gradient sections of often faster-moving streams (Rosgen G and A streams). The *Menyanthes trifoliata* Association was sampled on saturated peat immediately adjacent to a stream.

Elevation and ambient air temperature and, thus, the corresponding adjacent upland vegetation zone may sometimes predict the occurrence of particular aquatic associations in lakes and ponds or streams. For example, *Glyceria borealis*, *Nuphar lutea* ssp. *polysepala* and *Sparganium angustifolium* are found at much higher elevations (up to the subalpine fir zone) in the East Cascades and Blue Mountain (and presumably Basin and Range) ecoregions, whereas *Torreyochloa pallida* var. *pauciflora*, *Schoenoplectus tabernaemontani/acutus* var. *acutus* and *Typha latifolia* are rarely, if ever, seen at these elevations. Such generalities, however, "need to be interpreted carefully when considering cold air drainage and permanently flooded water tables. For instance, low precipitation and high summer temperatures at low elevation may be modified by the inflow of cold water from streams originating at higher elevation" (Kovalchik 2001) or from inflow of groundwater from springs within or adjacent to bodies of water.

Typha latifolia Association

Broad-leaved cattail Association
5 plots. CEGL002010

Ecoregional Range:
BM, BR, CB, CR, EC, KM, WC, WV.

Environment and Soils
This association is found at permanently or semi-permanently flooded sites at the edges of lakes and ponds and in ditches, oxbows and backwater areas. Two sites sampled were along the edge of wide, shallow Rosgen F type streams in box canyons. The water on the site is shallow and often poorly oxygenated and nitrogen-rich. Water depths average 10-45 cm deep and may drop to 15-20 cm below the soil surface later in the growing season. Soils are organic oozes (sapric histosols), mucks (hemic histosols) or peats (fibric histosols) or organic-rich loams with 21-100 cm depth of organic material.

Valley Environment	Average	Range
Elevation (ft)	3447	2450-5060
Plot Slope (%)	1	0-5
Soil Surface Cover (%)		
Submerged	87	60-100
Cryptogam	tr	0-1
Litter	80	40-100

Vegetation Composition
Typha latifolia dominates the vegetation composition. Plants are typically 1-2 m in height. Where sites are less inundated other herbaceous species can be more abundant. Since Typha grows in shallow water, most of the plant stem and long, linear leaves are emergent and this association is visually distinctive.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Small-fruit bulrush (*Scirpus microcarpus*)	40	10	5-15
PERENNIAL FORBS			
Common cattail (*Typha latifolia*)	100	68	40-95
Duckweed (*Lemna minor*)	60	27	5-70
Bay forget-me-not (*Myosotis laxa*)	60	5	1-15

Adjacent Vegetation

Where this association is found in lakes and ponds, adjacent aquatic associations in deeper water include tall bulrush spp. associations, pondweed spp. Associations, and the Rocky Mountain pondlily association. The *Typha latifolia* association may also be adjacent to or intermixed with the *Phragmites australis* and *Schoenoplectus acutus* var. *acutus* associations. On drier sites, bladder sedge or inflated sedge associations are common. Adjacent upland vegetation at sampled sites ranged from Western juniper/big sagebrush/basin wildrye to Ponderosa pine associations.

Successional Dynamics

If common cattail (*Typha latifolia*) association sites change with increased accumulation of organic matter or siltation and decreases in water depths, other graminoid associations will become established on the sites. Which association becomes dominant depends on ecoregional location and local factors affecting general climate such as elevation, soil and water temperatures and rate of site change. Hansen *et al.* (1995) report that sites can be changed to Nebraska sedge (*Carex nebrascensis*) associations with heavy livestock grazing and drying of soils.

Typha latifolia is well adapted to prolonged submergence but requires some period of bare soil exposure for germination and establishment. Seed production is high and it is capable of rapid colonization of wet mineral soils (Hansen *et al.* 1995).

Other Studies Documenting Association with Plot Data

Oregon: Copeland 1979a:12; Boss 1983:51, 98; Sanville et al. 1986:127; Crowe and Clausnitzer 1997: 202; Murray 2000; NRCS Semi-Wet Marsh Ecological Site (023XY116OR-Harney County)
Washington: Dethier 1990:36; Kovalchik 2001; Kunze 1994:24, 97; Titus et al. 1997.
Utah and Idaho: Padgett *et al.* 1989
Montana: Hansen *et al.* 1995.
South Dakota: Marriott and Faber-Langendoen, 2000.
Colorado: Kittel *et al.* 1999.
Wyoming and Idaho: Youngblood *et al.* 1985.

Other Studies Documenting Association without Plot Data

Idaho: Jankovsky-Jones *et al.* 2001: 181.

Sparganium angustifolium (S. emersum) Association

Narrowleaf bur-reed Association
5 plots. CEGL001990

Ecoregional Range

BM, BR, CR, EC, WV
This association is on the Heritage plant association list for Washington.

Environment and Soils

This association is found at the edges of lakes and ponds and sometimes in slackwater areas of low gradient streams. Water depths average 100-150 cm deep. Soils are organic peats (fibric histosols) or silt loams.

Valley Environment	Average	Range
Elevation (ft)	5476	4750-7220
Plot Slope (%)	0	0-1
Soil Surface Cover (%)		
Submerged	98	97-100
Bare Ground	10	0-50
Litter	11	0-50

Vegetation Composition

Sparganium angustifolium dominates the vegetation composition. Mean percent cover is 93%, ranging from 56-130%. Mean richness is 7.5, ranging from 7-8. This association has a characteristic look to it in that the leaves of the Sparganium are mostly prostrate on the water surface and the fruits, which resemble medieval maces, emerge above the water's surface.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Bladder sedge (*Carex utriculata*)	60	8	3-15
Inflated sedge (*Carex vesicaria*)	40	29	2-55
PERENNIAL GRASSES			
Weak alkaligrass (*Torreyochloa pallida* var. *pauciflora*)	40	3	1-5
PERENNIAL FORBS			
Narrow-leaf burreed (*Sparganium angustifolium*)	100	47	28-85

Adjacent Vegetation

Where this association is found in lakes and ponds, adjacent associations in shallower water include pondweed (*Potamogeton*) spp. associations, bulrush (*Schoenoplectus*) spp. associations, and the Creeping spikerush (*Eleocharis palustris*) association. On the shore are often Bladder sedge (*Carex utriculata*) or Inflated sedge (*Carex vesicaria*) Associations. Adjacent upland vegetation ranged from Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Ponderosa pine/Geyer's sedge (*Carex geyeri*) associations to Subalpine fir (*Abies lasiocarpa*) associations.

Other Studies Documenting Association with Plot Data

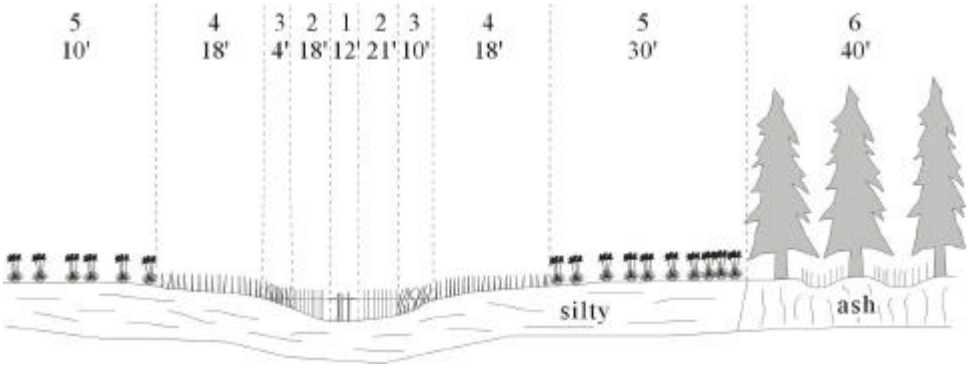
Oregon: Christy & Putera 1993; Christy et al. 1998: 138; Murray 2000
Washington: Kovalchik 1992:185 (WA); Kunze 1994:50, 59 (WA)
Alaska: Boggs 2000.

Other Studies Documenting Association without Plot Data

Oregon: Titus & Christy 1996a, 1999.

Illustrations

1.**Narrow-leaved burreed**, shallow pond
2.**Creeping spikerush**, perimeter of shallow pond
3.**Inflated sedge**, edge of shallow pond
4.**Aquatic sedge**, wet meadow
5.**Tufted hairgrass**, moist meadow
6.**Grand fir/woolly sedge**, forested swamp



Frog Heaven Meadows, La Grande RD, Wallowa-Whitman NF; headwater basin with pond and surrounding meadows

Ranunculus aquatilis Association

Water crowfoot Association
4 plots. CEGL0001984 = *Ranunculus aquatilis - Callitriche palustris*

Ecoregional Range

BM, BR, CB, CR, EC, KM, WC, WV. This association is on the Heritage plant association list for Washington.

Environment and Soils

This association is widespread and found in natural ponds, stockponds, ditches and slow-moving streams. The water on these sites is often poorly oxygenated and nitrogen-rich. Water depths average 30-60 cm deep. Soils are organic oozes (sapric histosols), organic rich loams, sandy loams or sands.

Valley Environment	Average	Range
Elevation (ft)	4638	4500-4950
Plot Slope (%)	2	0-5
Soil Surface Cover (%)		
Submerged	56	35-90
Bare Ground	4	0-15
Cryptogam	2	0-5
Litter	20	0-50

Vegetation Composition

Mean total percent cover is 88%, ranging from 39-130%. This is a low diversity association, with mean richness at 7.4, ranging from 5-9. The *Ranunculus* plants are mostly submerged with only the uppermost leaves and stems touching the water surface, and thus are only observed when looking directly into the pond water. The small white flowers, however, float on the water's surface and are quite distinctive.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Bladder sedge (*Carex utriculata*)	50	5	2-7
Creeping spikerush (*Eleocharis palustris*)	50	3	--
PERENNIAL GRASSES			
Weak alkaligrass (*Torreyochloa pallida* var. *pauciflora*)	75	5	3-7
PERENNIAL FORBS			
White water buttercup (*Ranunculus aquatilis*)	100	48	20-80
Floating pondweed (*Potamogeton natans*)	50	19	10-27
Vernal waterstarwort (*Callitriche palustris*)	50	5	2-7
Spearwort buttercup (*Ranunculus flammula*)	50	4	3-4

Adjacent Vegetation

Where this association is found in lakes and ponds, adjacent aquatic associations in deeper water include tall *Schoenoplectus* spp. associations, *Potamogeton* spp. associations and the *Nuphar lutea* ssp. *polysepala* association. Associations in shallower water or adjacent saturated soils include Creeping spikerush (*Eleocharis palustris*), Baltic rush (*Juncus balticus*), Bladder sedge (*Carex utriculata*), Nebraska sedge (*Carex nebrascensis*) and Inflated sedge (*Carex vesicaria*).

Other Studies Documenting Association with Plot Data

Alaska: Viereck, *et al.* 1992: 206; Boggs 2000: 181.

Other Studies Documenting Association without Plot Data

Jankovsky-Jones *et al.* 2001.

Menyanthes trifoliata Association

Bog buckbean Association
3 plots. New type

Ecoregional Range

BM, CR, EC, WC, WV. This association is on the Heritage plant association list for Washington.

Environment and Soils

This association grows on the edges of ponds and lakes and occasionally along slackwater areas of low gradient, slow-moving streams. Sites are submerged though much of the year, but, as indicated below, may dry to the soil surface during the growing season. Water depths average 10-35 cm. Boggs (2000) reports that bog buckbean typically forms a 25-75 cm thick rootmat that is either anchored in the pond or lake substrate or floating. Soils on these sites can be silts or organic peats (fibric histosols). The ponds and lakes are generally located within very low gradient (1 % slopes or less), wide (approximately 100 to 300 meters), trough shaped valleys. This association is found on stream orders 3 and 4.

Valley Environment	Average	Range
Elevation (ft)	5657	4920-6750
Plot Slope (%)	1	--
Soil Surface Cover (%)		
Submerged	85	0-85
Bare Ground	34	0-100
Bedrock	3	0-10
Litter	34	0-100

Vegetation Composition

This association has low species diversity with a mean richness of 8, ranging from 7-10. Mean percent cover is 100%, ranging from 66-132%.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Bladder sedge (*Carex utriculata*)	67	20	10-30
Creeping spikerush (*Eleocharis palustris*)	67	4	2-5
PERENNIAL FORBS			
Bog buckbean (*Menyanthes trifoliata*)	100	42	15-70
Common bladderwort (*Utricularia macrorhiza*)	67	5	--
Rocky Mountain pondlily (*Nuphar lutea* ssp. *polysepala*)	33	30	--
Pondweed (*Potamogeton*) spp.	33	20	--

Adjacent Vegetation

One site sampled had an adjacent Rocky Mountain pondlily (*Nuphar lutea* ssp. *polysepala*) Association in deeper water. The adjacent upland vegetation of another site comprised Ponderosa pine (*Pinus ponderosa*) forest.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997:200; Murray 2000: 23.
Alaska: Boggs 2000: 171.

Other Studies Documenting Association without Plot Data

Alaska: Viereck *et al.* 1992: 198; Shepard 1995: 197.

Nuphar lutea ssp. polysepala Association

Pond-lily Association
4 plots. CEGL002001

Ecoregional Range

BM, CR, EC, WC, WV

Environment and Soils

Sites are lakes and ponds that are usually inundated year-round, but occasionally dry by the end of summer. Water depths average 40-75 cm. Lake and pond substrates range from organic oozes (sapric histosols) and peats (fibric histosols) to silt and clay loam mineral soils.

Valley Environment	Average	Range
Elevation (ft)	6533	5500-7430
Soil Surface Cover (%)		
Submerged	96	90-98
Litter	6	2-10

Vegetation Composition

Rocky Mountain pondlily (*Nuphar lutea* ssp. *polysepala*) dominates the vegetation. Most other species present are submerged or floating aquatic species. Occasionally inflated sedge (*Carex vesicaria*) occurred in the species mix if the site was close to the shoreline.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Creeping spikerush (*Eleocharis palustris*)	50	2	1-3
PERENNIAL FORBS			
Rocky Mountain pondlily (*Nuphar lutea* ssp. *polysepala*)	100	41	35-50
Common bladderwort (*Utricularia macrorhiza*)	50	5	--
Pondweed (*Potamogeton*) spp.	50	4	5
Flatleaf bladderwort (*Utricularia intermedia*)	25	37	--

Adjacent Vegetation

Since this association occurs in deeper water than any other described in this classification, there are no adjacent associations in deep water. Commonly adjacent in shallower water can be *Potamogeton* spp. associations, the *Sparganium angustifolium* Association, and the *Eleocharis palustris* Association. Upland vegetation commonly found adjacent to this association consists of subalpine fir (*Abies lasiocarpa*), grand fir (*Abies grandis*), and mountain hemlock (*Tsuga mertensiana*) associations.

Other Studies Documenting Association with Plot Data

Oregon: Christy *et al.* 1998: 134; Titus and Christy 1996a, 1999; Murray 2000: 23
Washington: Kovalchik 2001; Seyer 1979: 46; Kunze 1994: 23, 80.
Alaska: Boggs 2000; Viereck et al. 1992:204; Shepard 1995: 187.
Wyoming-Idaho: Youngblood *et al.* 1985.

Other Studies Documenting Association without Plot Data

Oregon: Peck 1919: 347; Egler 1934; Hansen 1942: 525; Seyer 1981: 7.
Idaho: Jankovsky-Jones 2001.

Veronica americana Association

American speedwell Association
5 plots. New type

Ecoregional Range

BM, EC, WV. This association is on the Heritage plant association list for Washington.

Environment and Soils

The *Veronica americana* Association was found mostly in streams on channel shelves (alluvial bars parallel to the banks of a stream) in extremely shallow (generally 5-10 cm water depth), gentle gradient sections of often faster-moving streams (Rosgen G and A streams). One site was a organic soil immediately adjacent to the stream channel, which may have been formed by a toeslope spring emptying onto the floodplain. Most sites had a least 10 cm of organic material on the soil surface and are also generally coarse fragment-rich at shallow depths. Valleys are generally high gradient, narrow and V-shaped. Soils are usually saturated throughout the growing season and are generally coarse-fragment rich.

Valley Environment	Average	Range
Elevation (ft)	5108	4300-6030
Plot Slope (%)	7	1-15
Valley Width (m)	9	5-20
Valley Gradient (%)	9	5-10
Valley Sideslopes (%)	38	15-45
Soil Surface Cover (%)		
Submerged	47	0-100
Bare Ground	7	0-30
Gravel	tr	0-1
Cryptogam	39	0-95
Litter	8	0-34

Vegetation Composition

Veronica americana is the dominant forb species mixed with various forbs and graminoids. Occasionally stinking swamp currant (*Ribes hudsonianum*) or Prickly currant (*Ribes lacustre*) was present on the sites sampled. Two plots had high cover of *Poa palustris*, an introduced species. Mean total cover is 104%, ranging from 66-146%. Mean richness is 13.5, ranging from 5-18. This plant association is found on stream orders 1, 2 and 3.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	80	6	1-16
Spike bentgrass (*Agrostis exarata*)	80	13	1-30
PERENNIAL FORBS			
American speedwell (*Veronica americana*)	100	39	21-55
Yellow monkeyflower (*Mimulus guttatus*)	80	12	2-30
Musk monkeyflower (*Mimulus moschatus*)	60	8	1-20
Hairy willow-herb (*Epilobium ciliatum*)	60	7	3-13

Adjacent Vegetation

Adjacent upland vegetation comprised moist Grand fir (*Abies grandis*) associations (*A. grandis* with twinflower (*Linnaea borealis*), heart-leaf arnica (*Arnica cordifolia*), grouse huckleberry (*Vaccinium scoparium*) or Pacific yew (*Taxus brevifolia*).

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997: 213.
Nevada: Manning and Padgett 1995

Other Studies Documenting Association without Plot Data

Utah-Idaho: Padgett *et al.* 1989

Glyceria borealis Association

Northern mannagrass Association
4 plots. CEGL001569

Ecoregional Range
BM, BR, EC

Environment and Soils
This association is found in at the edges of ponds and lakes as well as in slackwater areas of low-gradient, slow-moving streams. Soils are range from organic rich silts to peats to oozes. Water depth was measured on only one site sampled and was 40 cm.

Valley Environment	Average	Range
Elevation (ft)	5328	4210-6700
Plot Slope (%)	0	--
Soil Surface Cover (%)		
Submerged	100	--

Vegetation Composition
Glyceria borealis dominates the tallest herbaceous layer in this community. Plants are generally 2-4 ft. tall.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Bladder sedge (*Carex utriculata*)	50	7	3-10
Creeping spikerush (*Eleocharis palustris*)	25	15	--
PERENNIAL GRASSES			
Northern mannagrass (*Glyceria borealis*)	100	30	20-37
Shortawn foxtail (*Alopecurus aequalis*)	25	35	--
PERENNIAL FORBS			
Common bladderwort (*Utricularia macrorhiza*)	25	15	--
Grass-leaved pondweed (*Potamogeton gramineus*)	25	15	--

Adjacent Vegetation
Adjacent upland vegetation near sampled sites comprised Grand fir (*Abies grandis*) and Subalpine fir (*Abies lasiocarpa*) associations.

Other Studies Documenting Association with Plot Data
Oregon: Boss 1983: 146; Sanville *et al.* 1986: 127; Viereck *et al.* 1992: 182
Washington: Kovalchik 2001
Montana: Hansen *et al.* 1995

Other Studies Documenting Association without Plot Data
Oregon: Titus and Christy 1996a, 1999

Torreyochloa pallida var. pauciflora Association

Weak alkaligrass Association
4 plots. New type

Ecoregional Range
BM, CR, EC

Environment and Soils
This association is generally found in narrow, shallow, low gradient streams within meadows. It also occurs, occasionally along the edges of lakes. Soils are usually mineral and standing water on the site usually ranges from 10-30 cm. This association is found on stream orders 1,2 and 3.

Valley Environment	Average	Range
Elevation (ft)	4925	4620-5300
Plot Slope (%)	2	0-6
Valley Width (m)	50	20-65
Valley Gradient (%)	4	2-5
Valley Sideslopes (%)	25	15-45
Soil Surface Cover (%)		
Submerged	66	35-98
Bare Ground	1	0-2
Cryptogam	2	0-4
Litter	16	0-60

Vegetation Composition
Weak alkaligrass is a strong dominant in three of the four plots sampled. Mean percent cover is 98%, ranging from 29-166%. This is not a diverse association, with mean richness of 7, ranging from 4-11.

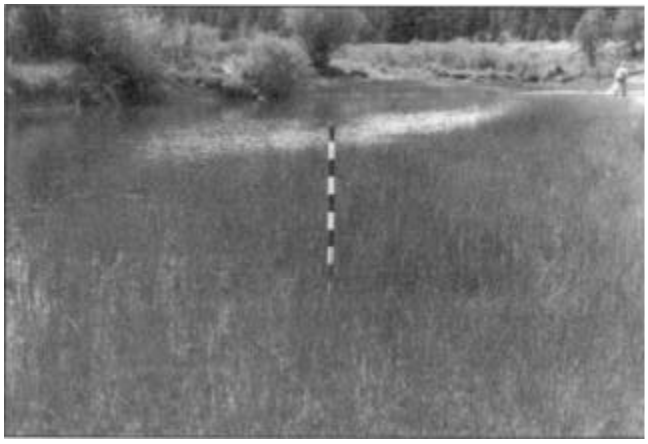
Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Baltic rush (*Juncus balticus*)	75	7	1-10
Creeping spikerush (*Eleocharis palustris*)	50	14	2-25
Swordleaf rush (*Juncus ensifolius*)	25	12	--
PERENNIAL GRASSES			
Weak alkaligrass (*Torreyochloa pallida* var. *pauciflora*)	100	54	15-70
PERENNIAL FORBS			
Hairy willow-herb (*Epilobium ciliatum*)	50	8	1-15
American speedwell (*Veronica americana*)	50	1	--
Yellow monkeyflower (*Mimulus guttatus*)	50	80	--

Adjacent Vegetation
Upland vegetation adjacent to the sites sampled comprised Ponderosa pine (*Pinus ponderosa*) associations. Riparian associations included Baltic rush (*Juncus balticus*), Big sagebrush/Cusick's bluegrass (*Artemisia tridentata/Poa cusickii*), and Quaking aspen/Common snowberry (*Populus tremuloides/Symphoricarpos albus*) Associations.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997: 212
Washington: Kovalchik 2001 sampled one plot in thus association but did not describe the type

Eleocharis palustris Stream/Perennial Pond Association

Creeping spikerush Stream/Perennial Pond Association
23 plots. CEGL001833.



Ecoregional Range

BM, BR, CB, CR, EC, KM, WC, WV

Environment and Soils

The *Eleocharis palustris* stream/perennial pond association is found throughout central and eastern Oregon over a wide range of elevations, ecoregions, and riparian landforms. Sites are semi-permanently to permanently flooded along the edges of lakes and ponds, stockponds, or reservoirs, or in slackwater areas or along channel shelves of slow-moving Rosgen E and C streams. The majority of streams were E6 and the rest were E4, C4, C3 and C2 streams. Valleys in which this association occurs are generally broad and low gradient.

Soils often are rich in coarse fragments at shallow depths. The surface of most soils has a high organic content. Soils on the margins of lakes and older reservoirs are organic-rich loam and sedimentary peat. Soils associated with stockponds are fine sandy loams. Available water holding capacity is moderate to high. Where the sites sampled had aboveground water, the water depth averaged 20 cm with a range of 1 to 45 cm. Many sites sampled had a water table just below the soil surface. Reservoirs, stockponds and lakes with more than 2 to 4 feet seasonal fluctuation in their water tables will not support this or other riparian associations along their margins.

Valley Environment	Average	Range
Elevation (ft)	4539	2860-6750
Plot Slope (%)	1	0-5
Valley Width (m)	203	20-350
Valley Gradient (%)	2	2-5
Valley Sideslopes (%)	31	15-70
Soil Surface Cover (%)		
Submerged	45	0-100
Bare Ground	24	0-100
Gravel	2	0-10
Rock	11	0-80
Cryptogam	7	0-90
Litter	13	0-100

Vegetation Composition

Eleocharis palustris is the dominant graminoid. It is an aggressive, rhizomatous species and excludes other species from establishing any great cover. Aquatic forbs are abundant along the shallow margins of lakes and reservoirs by mid summer. In basins they will be present in flooded years and absent in dry years.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Creeping spikerush (*Eleocharis palustris*)	100	51	10-90
Bladder sedge (*Carex utriculata*)	29	8	1-30
Inflated sedge (*Carex vesicaria*)	24	8	2-15
Baltic rush (*Juncus balticus*)	24	4	3-6
Nevada sedge (*Juncus nevadensis*)	24	4	1-15
PERENNIAL FORBS			
Field mint (*Mentha arvensis*)	48	8	1-50
White water buttercup (*Ranunculus aquatilis*)	24	8	1-20
Meadow arnica (*Arnica chamissonis*)	24	4	1-15

Adjacent Vegetation

Upland vegetation adjacent to the sites sampled ranged from grand fir (*Abies grandis*) and white fir (*Abies concolor*) to ponderosa pine (*Pinus ponderosa*) and big sagebrush (*Artemisia tridentata*) associations. On floodplains immediately adjacent to This association were often willow (*Salix*) spp. associations.

Successional Dynamics

Eleocharis palustris is a a pioneer on coarse-fragment rich, submerged sites. It frequently forms a seral community in ponded sites between stream rehabilitation structures such as loose rock check dams (Kovalchik 1987). As sites receive more fine-textured sediments and become elevated above the normal bankfull zone, sedges may become more dominant on the site. If the site is still wet throughout the growing season, inflated sedge (*Carex vesicaria*) or, more likely, bladder sedge (*Carex utriculata*), may become dominant. As the site becomes drier, Nebraska sedge (*Carex nebrascensis*) or aquatic sedge (*Carex aquatilis*) may become dominant.

Other Studies Documenting Association with Plot Data

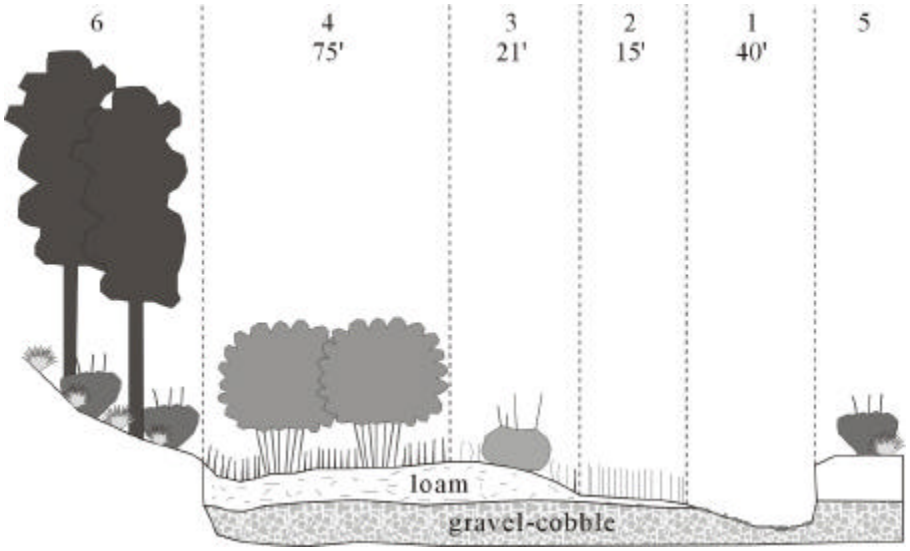
Oregon: Padgett 1981: 79; Henderson and McAllister 1983:2; Boss 1983: 67; Kovalchik 1987: 120; Evenden 1990: 45; Titus and Christy 1996a, 1999; Crowe and Clausnitzer 1997: 182; Murray 2000
Washington: Kunze 1994: 42, 55; Kovalchik 2001
Nevada: Manning and Padgett 1995
Idaho: Jankovsky-Jones *et al.* 2001
Colorado: Kittel *et al.* 1999
Wyoming-Idaho: Youngblood *et al.* 1985
Utah-Idaho: Padgett *et al.* 1989

Other Studies Documenting Association without Plot Data

Oregon: Griffiths 1902: 46; Harris 1954: 406; Kierstead and Pogson 1976: 1-14; Bork: 1978: 69; Seyer 1981: 21; Easterday and Mamone 1980: 16; Marshall 1985: 143.

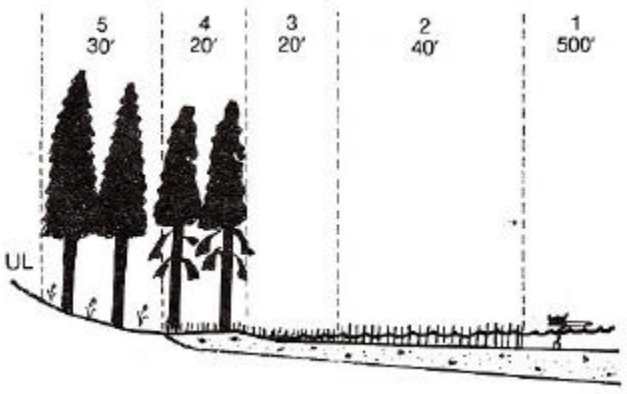
Illustrations

1.C4 stream reach
2.**Creeping spikerush**, point bar
3.**Silver sagebrush/Kentucky bluegrass**, levee-inactive floodplain
4.**Willow/woolly sedge**, floodplain
5.Big sagebrush/Idaho fescue-bluebunch wheatgrass, terrace
6.Ponderosa pine/big sagebrush/Idaho fescue-bluebunch wheatgrass, east-facing sideslope



Silvies River, Burns RD, Malheur NF; veru low gradient, mod. elevation, flat-shaped valley

1.Shallow, **Indian pondlily**-dominated pond
2.**Creeping spikerush**, permanently flooded shore
3.**Inflated sedge**, semi-permenently flooded shore
4.**Lodgepole pine/aquatic sedge**, forested wetland
5.White fir/queencup beadlily, transition slope



Pond near Campbell Lake; concave,mod-high elevation basin;
Basin and Range Physiographic Area; Fremont National Forest.

Callitriche palustris Association

Spring water-starwort Association
1 plot. New type

Ecoregional Range
CR, EC, KM, WV. This association is on the Heritage plant association list for Washington.

General Description
Although one plot is not enough evidence for an association, this type is described as such based on description in Boggs (2000). The site sampled is within a stream with 1% gradient at 6400 ft. The site had a water depth of 65 cm and the stream bed material is a thick peat. This association is found on stream orders 3 and 4.

Vegetation Composition
The vegetation cover is sparse. Total cover is 55%. Richness is 16.

Nearby Studies Documenting Association with Plot Data
Alaska: Boggs 2000.

Dominant Species	Canopy Cover (%)
SEDGES and RUSHES	
Creeping spikerush (*Eleocharis palustris*)	3
PERENNIAL FORBS	
Vernal waterstarwort (*Callitriche palustris*)	20
Ribbonleaf pondweed (*Potamogeton epihydrus*)	7
Longroot smartweed (*Polygonum coccineum*)	3
Narrow-leaf burreed (*Sparganium angustifolium*)	3

Ceratophyllum demersum Association

Coontail Association
1plot. CEGL004528

Ecoregional Range
CR, EC, KM, WV. This association is on the Heritage plant association list for Washington.

General Description
Although one plot is not enough evidence for an association, this type is described as such based on description in Jankovsky-Jones *et al.* (2001). The site sampled is within a stock pond at 4530 ft. elevation. Material on the pond bed is a organic-rich silt. This association is found on stream order 4.

Vegetation Composition
The vegetation is somewhat sparse. Total cover is 72%. Richness is 7.

Nearby Studies Documenting Association without Plot Data
Idaho: Jankovsky-Jones *et al.* 2001

Dominant Species	Canopy Cover (%)
SEDGES and RUSHES	
Creeping spikerush (*Eleocharis palustris*)	5
Needle spikerush (*Eleocharis acicularis*)	5
PERENNIAL GRASSES	
Northern mannagrass (*Glyceria borealis*)	5
PERENNIAL FORBS	
Coon's tail (*Ceratophyllum demersum*)	37
Narrow-leaf burreed (*Sparganium angustifolium*)	15
Duckweed (*Lemna minor*)	5

Elodea canadensis Association

Canadian waterweed Association
1 plot. New type

Ecoregional Range
CR, EC, WC, WV

General Description
Although one plot is not enough evidence for an association, the studies listed below substantiate that this association exists. Total cover is 171%. Richness is 7. The sample plot along the edge of a lake is at 5,060 feet elevation. The water was 45 cm deep and the lake bed is composed of a 70 cm thick ooze (sapric or limnic histosol). This plant association is found on stream orders 3 and 4. This association is on the Heritage plant association list for Washington.

Vegetation Composition
This type is comprised of floating and emergent vegetation along lake margins.

Dominant Species	Canopy Cover (%)
SEDGES and RUSHES	
Creeping spikerush (*Eleocharis palustris*)	30
PERENNIAL GRASSES	
Weak alkaligrass (*Torreyochloa pallida* var. *pauciflora*)	30
PERENNIAL FORBS	
Canadian waterweed (*Elodea canadensis*)	30
Duckweed (*Lemna minor*)	30

Nearby Studies Documenting Association with Plot Data
Washington:Kunze 1994:42, 46, 55.

Nearby Studies Documenting Association without Plot Data
Oregon: Titus and Christy 1996a, 1999.
Idaho: Jankovsky-Jones *et al.* 2001.

Schoenoplectus validus Association

Softstem bulrush Association
1plot. CEGL002623

Ecoregional Range
BM, BR, CB, CR, EC, KM, WC, WV

General Description
Although one plot is not enough evidence for an association, the studies listed below substantiate that this association exists. Kovalchik (2001) includes *Schoenoplectus validus* in his *Scirpus* spp. Association. The site sampled was at 5040 ft elevation along the edge of a pond. The pond substrate is a 90 cm thick organic ooze (sapric histosol) and the water depth was 40cm at the time of sampling.

Vegetation Composition
Although *Schoenoplectus validus* was dominant, *Utricularia macrorhiza* was abundant under the surface of the water. The *Schoenoplectus* plants are generally about 1-2 m in height.

Dominant Species	Canopy Cover (%)
SEDGES and RUSHES	
Softstem bulrush (*Schoenoplectus tabernaemontani*)	70
Inflated sedge (Carex vesicaria)	10
Bladder sedge (*Carex utriculata*)	10
PERENNIAL FORBS	
Common bladderwort (*Utricularia macrorhiza*)	50
Narrow-leaf burreed (*Sparganium angustifolium*)	3

Other Studies Documenting Association with Plot Data
Oregon: Smith and Smith 1976: 132; Boss 1983: 126, 146; Sanville *et al.* 1986: 127; Kunze 1994: 49.
Washington: Kovalchik 2001.
Colorado: Kittel *et al.* 1999.

Other Studies Documenting Association without Plot Data
Oregon: Jefferson 1975: 54; McDonald 1977: 172; Thomas 1980: 6.
Alaska: Viereck *et al.* 1992: 181.
Idaho: Jankovsky-Jones *et al.* 2001.

Schoenoplectus acutus var. *acutus* Association

Hardstem bulrush Association
1 plot. CEGL001840

Ecoregional Range
BM, BR, CB, CR EC, KM, WC, WV

General Description
Although one plot is not enough evidence for an association, the studies listed below substantiate that this association exists. Kovalchik (2001) includes *Schoenoplectus acutus* var. *acutus* in his *Scirpus* spp. Association. The site sampled along the edge of a pond at 4700 ft elevation. The pond substrate is an organic ooze (sapric or limnic histosol).

Vegetation Composition
Schoenoplectus and other emergent graminoids dominate the site creating two layers of herbaceous vegetation.

Dominant Species	Canopy Cover (%)
SEDGES and RUSHES	
Hardstem bulrush (*Schoenoplectus acutus* var. *acutus*)	63
Creeping spikerush (*Eleocharis palustris*)	37
Bladder sedge (*Carex utriculata*)	10
PERENNIAL FORBS	
Water knotweed (*Polygonum amphibium*)	15

Other Studies Documenting Association with Plot Data
Oregon: NRCS Wet Marsh Ecological Site (023XY115OR-Harney County)
Montana: Hansen *et al.* 1995.
Wyoming and Utah: Youngblood *et al.* 1985.
Utah and Idaho: Padgett *et al.* 1989.

Potamogeton diversifolius Association

Diverse-leaved pondweed Association
1 plot. CEGL002007

Ecoregional Range
EC. This association is on the Heritage plant association list for Washington.

General Description
Although one plot is not enough evidence for an association, the studies listed below include this species in their *Potamogeton* spp. Association. In this classification the species have been separated into separate associations by species dominance. The site sampled is at the edge of a pond at 4700 ft elevation and had a water depth of 45 cm at the time of sampling. The soil is a 55 cm thick organic ooze (sapric histosol). This plant association is found on stream order 4.

Vegetation Composition
Total cover is 67% and richness is 8.

Dominant Species	Canopy Cover (%)
SEDGES and RUSHES	
Inflated sedge (*Carex vesicaria*)	17
Nevada sedge (*Juncus nevadensis*)	7
PERENNIAL GRASSES	
Northern mannagrass (*Glyceria borealis*)	3
PERENNIAL FORBS	
Waterthread pondweed (*Potamogeton diversifolius*)	32
Common bladderwort (*Utricularia macrorhiza*)	3

Other Studies Documenting Association with Plot Data
Washington: Kovalchik 2001.

Other Studies Documenting Association without Plot Data
Idaho: Jankovsky-Jones *et al.* 2001

Potamogeton gramineus Association

Grass-leaved pondweed Association
2 plots. New type

Ecoregional Range
EC

General Description
Although one plot is not enough evidence for an association, the studies listed below substantiate the existence of this association. Kovalchik (2001) and Jankovsky-Jones *et al.* (2001) include this species in their *Potamogeton* spp Association. In this classification the species have been separated into separate associations by species dominance. Sample plots were in ponds ranging in elevation from 4600-4950 ft. The pond substrates were mineral silt and pumice. Water depth was measured on one site and was 80cm. This association is found on stream order 4.

Vegetation Composition
Total cover is 40%, ranging from 23-57. Richness is 5.5, ranging from 4-7.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
PERENNIAL FORBS			
Grass-leaved pondweed (*Potamogeton gramineus*)	100	25	15-35
Rocky Mountain pondlily (*Nuphar lutea* ssp. *polysepala*)	50	4	0-7
Common bladderwort (*Utricularia macrorhiza*)	50	3	0-5
Duckweed (*Lemna minor*)	50	3	0-5
Common hawkweed (*Hieracium lachenalii*)	50	3	0-5
Burreed (*Sparganium natans*)	50	2	0-4

Other Studies Documenting Association with Plot Data
Washington: Kovalchik 2001
Alaska: Boggs 2000

Other Studies Documenting Association without Plot Data
Idaho: Jankovsky-Jones 2001

Potamogeton natans Association

Floating-leaved pondweed Association
1 plot. New type

Ecoregional Range
CR, EC, KM, WC, WV

General Description
Although one plot is not enough evidence for an association, the studies listed below substantiate the existence of this association. Kovalchik (2001) and Jankovsky-Jones *et al.* (2001) include this species in their *Potamogeton* spp Association. In this classification the species have been separated into separate associations by species dominance. The site sampled was in a low gradient, slow-moving section of a stream at 4660 ft elevation. The stream substrate is a 30 cm thick organic ooze (sapric histosol). The water depth at the time of sampling was 70 cm. This association is found on stream order 4.

Dominant Species	Canopy Cover (%)
SEDGES and RUSHES	
Sitka sedge (*Carex aquatilis* var. *dives*)	15
Baltic rush (*Juncus balticus*)	2
PERENNIAL GRASSES	
Weak alkaligrass (*Torreyochloa pallida* var. *pauciflora*)	10
PERENNIAL FORBS	
Floating-leaved pondweed (*Potamogeton natans*)	25
Spearwort buttercup (*Ranunculus flammula*)	15
Common bladderwort (*Utricularia macrorhiza*)	2
Narrow-leaf burreed (*Sparganium angustifolium*)	2

Vegetation Composition
Total cover on the site is 71% and richness is 7.

Other Studies Documenting Association with Plot Data
Oregon: Christy et al. 1998: 136.
Washington: Kovalchik 2001
Alaska: Boggs 2000

Other Studies Documenting Association without Plot Data
Idaho: Jones-Jones 2001

Rorippa nasturtium-aquaticum Association

Water-cress Association
1 plot. New type

Ecoregional Range
EC, BM. This association is on the Heritage plant association list for Washington.

General Description
Although one plot is not enough evidence for an association, the sources listed below substantiate the existence of this association. The site sampled is a pond at 3000 ft elevation on a thick (99 cm) organic ooze (sapric histosol) site. The water depth on the site was 10 cm at the time of sampling. This association has been seen on tributaries to the Snake River in the Hell's Canyon NRA. This association is found on stream orders 3 and 4.

Vegetation Composition
This is a pond community dominated by watercress. Mean total cover is 123. Richness is 9.

Dominant Species	Canopy Cover (%)
SEDGES and RUSHES	
Baltic rush (*Juncus balticus*)	5
Nebraska sedge (*Carex nebrascensis*)	5
PERENNIAL FORBS	
Watercress (*Rorippa nasturtium-aquaticum*)	63
Water speedwell (*Veronica anagallis-aquatica*)	15
Hairy willow-herb (*Epilobium ciliatum*)	15
Bay forget-me-not (*Myosotis laxa*)	5
Duckweed (*Lemna minor*)	5
Yellow monkeyflower (*Mimulus guttatus*)	5

Other Studies Documenting Association with Plot Data
Nevada: Manning and Padgett 1995

Other Studies Documenting Association without Plot Data
Utah-Idaho: Padgett *et al.* 1989

Eleocharis acicularis Association

Needle spikerush Association
1 plot. CEGL001832

Ecoregional Range
EC, BM

General Description
The plot sampled is from Big Marsh, Deschutes National Forest at 4700 ft with a slope of 1% (the slope corresponds to the near shore lakebed). This association occurs in ponds and lakes in water that is generally about 40-80 cm deep. It has been seen in subalpine lakes in the Elkhorn and Wallowa Mountains in the Blue Mountains Ecoregion.

Dominant Species	Canopy Cover (%)
SEDGES and RUSHES	
Needle spikerush (*Eleocharis acicularis*)	90
PERENNIAL FORBS	
Canadian waterweed (*Elodea canadensis*)	15
Bolander's waterstarwort (*Callitriche heterophylla* var. *bolanderi*)	10
Stonewort (*Nitella* sp.)	10
Narrow-leaf burreed (*Sparganium angustifolium*)	1

Vegetation Composition
Eleocharis acicularis occurs in fairly evenly dispersed tufts on the lake bottom. With wave action, the stems, which are very thin and needle-like, become detached from the bottom and float on the surface of the lake.

Other Studies Documenting Association with Plot Data
Washington: Kovalchik 2001 reports having sampled one site with this vegetation types but does not describe it.

Other Studies Documenting Association without Plot Data
Pacific Northwest: Sanville *et al.* 1986: 127.

Eleocharis bella Community

Delicate spikerush Association
1 plot. New type

Ecoregional Range
BM

General Description
This community was already described in Crowe and Clausnitzer (1997). Information is taken from that source. The sample site was on the exposed mudflat of Strawberry Lake in the Strawberry Mountains near John Day, Oregon at 6340 ft elevation. Whether this community exists elsewhere is not known. The soil on the site is an organic ooze (Limnic Borosaprist) and was moist to the surface at the time of sampling (August). The water table was 20cm below the soil surface, but it probably 30-40 cm deep for most of the growing season. Subalpine fir associations surround the lake basin.

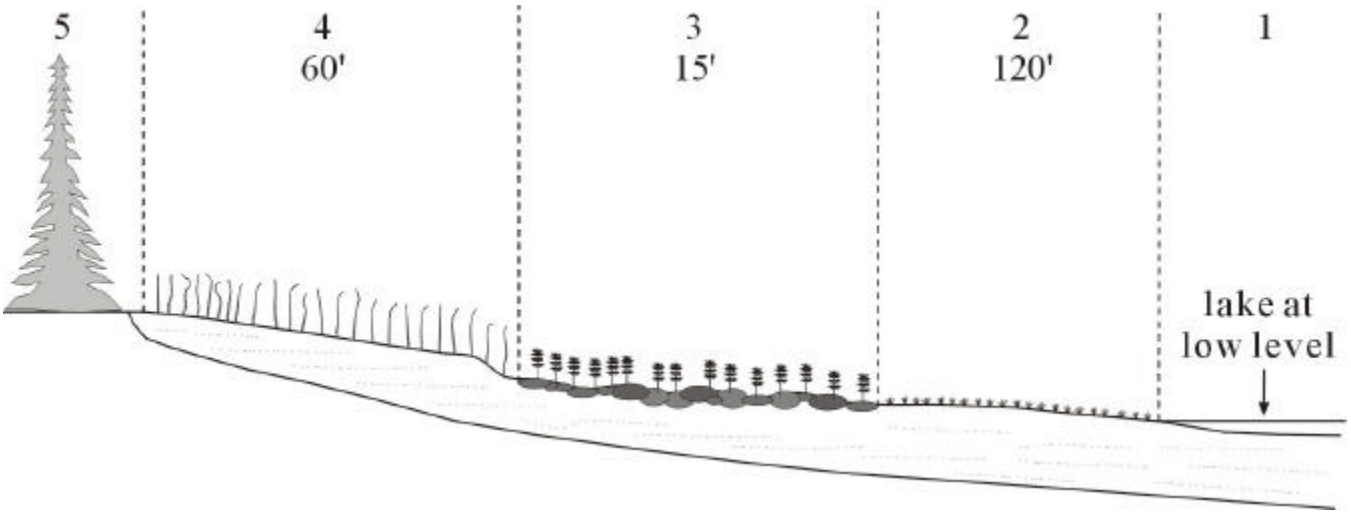
Vegetation Composition
The site is almost totally dominated by delicate spikerush, with a dense rootmass that prevents other species from become established.

Dominant Species	Canopy Cover (%)
SEDGES and RUSHES	
Delicate spikerush (*Eleocharis bella*)	90
Inflated sedge (*Carex vesicaria*)	4
PERENNIAL GRASSES	
Shortawn foxtail (*Alopecurus aequalis*)	14
PERENNIAL FORBS	
Spearwort buttercup (*Ranunculus flammula*)	13
Common horsetail (*Equisetum arvense*)	6
Curvepod yellowcress (*Rorippa curvisiliqua*)	6

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997: 200.

Illustrations

1.Strawberry Lake
2.**Delicate spikerush**, exposed lakebed
3.**Common horsetail**, alluvial fan where tributary stream enters lake basin
4.**Inflated sedge**, edge of lake at highwater level
5.Subalpine fir, surrounding sideslopes



Strawberry Lake, Prairie City RD, Malheur NF; high elevation basin

Dulichium arundinaceum Association

Threeway sedge Association
1 plot. CEGL001831

Ecoregional Range
CR, EC, WC, WV

General Description
This association was sampled at the edge of a pond at Big Marsh in Klamath County. The elevation is 4700 ft with a 1% slope.

Vegetation Composition
This is a dense stand of threeway sedge, with occasional floating or rooted plants.

Dominant Species	Canopy Cover (%)
SEDGES and RUSHES	
Threeway sedge (*Dulichium arundinaceum*)	80
PERENNIAL FORBS	
Grass-leaved pondweed (*Potamogeton gramineus*)	4
Bog buckbean (*Menyanthes trifoliata*)	2
Common bladderwort (*Utricularia macrorhiza*)	1

Adjacent Vegetation
Within Big Marsh adjacent to the Threeway Sedge Association are many acres of Slender sedge (*Carex lasiocarpa*) Associaton as well as Bladder sedge (*Carex utriculata*) Association and Baltic rush (*Juncus balticus*) Association.

Other Studies Documenting Association with Plot Data
Oregon: Titus and Christy 1999; Christy *et al.* 1998.
Washington: Kunze 1994:28

GRAMINOID ASSOCIATIONS

Carex amplifolia Association

Bigleaf sedge Association
17 plots. CEGL003427

Ecoregional Range
BM, CR, EC

Environment and Soils
The *Carex amplifolia* association was sampled at moderate elevations throughout the Blue Mountains and East Cascades. Valleys in which this association occurs are narrow, low to high gradient (1-10%) and V- or trough-shaped with gentle to steep side slopes. Wideleaf sedge occurs in springs or on floodplains with a spring source from the adjacent toe-slope. Water is often ponded on the site or is found near the soil surface. Soils are organic (Borohemists and Borosaprists) or mineral (Mollic Endoaquents, Histic Humaquepts, Typic Endoaquolls, and Typic Fluvaquents). All but one of the soils are coarse-fragment rich and shallow to a buried stream bed.

Valley Environment	Average	Range
Elevation (ft)	4532	2440-5920
Plot Slope (%)	10	1-40
Valley Width (m)	15	5-65
Valley Gradient (%)	8	2-40
Valley Sideslopes (%)	37	15-70
Soil Characteristics		
Thickness of Surface Organic Layer (cm)	34	8-76
Current Water Table Depth (cm)	18	0-48
Depth to 80% Coarse Fragments (cm)	39	23-76
Soil Surface Cover (%)		
Submerged	14	0-80
Bare Ground	6	0-5
Gravel	tr	0-5
Rock	2	0-10
Cryptogam	21	0-65
Litter	56	12-90

Vegetation Composition
Bigleaf sedge, which has a rhizomatous growth habit, forms a moderately dense to very dense herbaceous layer with scattered wet graminoids and forbs growing in the herbaceous understory, including sword-leaf rush, small-fruit bulrush, common monkey-flower, hairy willow-herb, American speedwell, white bog-orchid, large-leaf avens, and violets. Average height of herbaceous vegetation is 63 cm, ranging from 31 to 91 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Mountain alder (*Alnus incana*)	41	6	3-10
SEDGES and RUSHES			
Bigleaf sedge (*Carex amplifolia*)	100	49	15-95
Smallfruit bulrush (*Scirpus microcarpus*)	59	12	1-37
Swordleaf rush (*Juncus ensifolius*)	59	5	1-20
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	82	15	1-75
Kentucky bluegrass (*Poa pratensis*)	53	3	1-10
PERENNIAL FORBS			
Hairy willow-herb (*Epilobium ciliatum*)	59	4	1-15
Yellow monkeyflower (*Mimulus guttatus*)	53	3	1-15
Large-leaf avens (*Geum macrophyllum*)	47	2	1-5
American speedwell (*Veronica americana*)	41	4	1-6
White bog-orchid (*Habenaria dilatata*)	41	1	1-2

Adjacent Vegetation

Vegetation types surrounding sites sampled in the Blue Mountains are: Douglas-fir/common snowberry, Ponderosa pine/common snowberry, lodgepole pine-western larch (*Pinus contorta-Larix occidentalis*) communities, Grand fir/swordfern-wild ginger;
sideslopes - grand fir/elk sedge, grand fir/big huckleberry, Douglas-fir/common snowberry and other grand fir, ponderosa pine and occasionally subalpine fir (*Abies lasiocarpa*) associations.

Other Studies Documenting Association with Plot Data

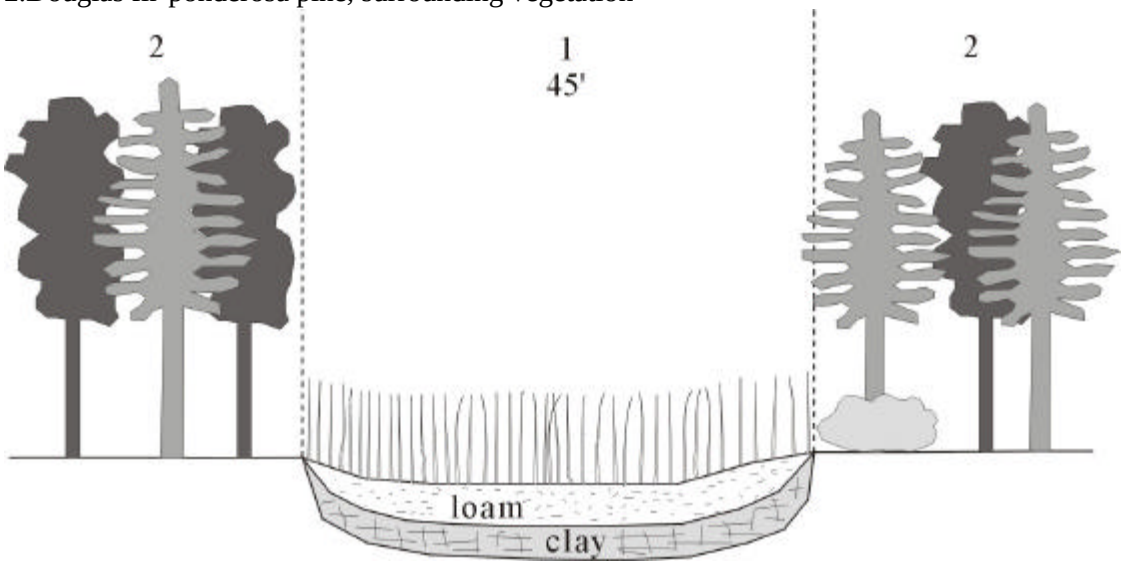
Oregon: Kovalchik 1987: 112 (in part); Larkin 1990: 2; Crowe and Clausnitzer 1997: 204; Murray 2001

Other Studies Documenting Association without Plot Data

Oregon: Glad *et al.* 1987: 261.

Illustrations

1.**Big-leaved sedge**, spring - on north-facing sideslope
2.Douglas fir-ponderosa pine, surrounding vegetation



Government Spring, Heppner RD, Umatilla NF; mod. elevation spring

Carex angustata (Carex eurycarpa) Association

Wide-fruited sedge Association
12 plots. New type

Ecoregional Range
EC

Environment and Soils
The widefruit sedge association is widespread on the East Cascade Mountains. It is most common in the LaPine Basin and in the Pumice-mantled Basin and Range Physiographic Areas of the Winema National Forest and the western edge of the Fremont National Forest. Elevations are low to moderate (3000-5700 feet). The most common landforms are meadows, active floodplains, and small, shallow, pumice-filled drainages. See the descriptions for bog blueberry/Sitka sedge, lodgepole pine/widefruit sedge, quaking aspen-lodgepole pine/Douglas spiraea/widefruit sedge for other figures illustrating this. Sample plots were located at Quinn Springs, Elk Lake, Lava Lake, Little Deschutes and Deschutes Rivers, and Canyon Creek on the Deschutes National Forest; Jack Creek, Little Round and O'Connor Meadows, and Mountain Lakes Wilderness on the Winema National Forest; and Coyote Creek on the Fremont National Forest.

Valley Environment	Average	Range
Elevation (ft)	4583	1300-6500
Plot Slope (%)	1	0-5
Soil Characteristics		
Depth of Current Water Tables (cm)	23	+20-110
Depth if Surface Organic Layer (cm)	44	22-65
Soil Surface Cover (%)		
Submerged	8	0-98
Bare Ground	20	0-70
Cryptogam	16	0-75
Litter	55	2-100

Widefruit sedge is closely associated with deep deposits of pumice ejected during the Mazama eruption. Soils are pumice alluvium. Surface horizons are organic loam, sedge peat, or sandy loam that grade to gravelly pumice in the C horizon. Available water holding capacity is moderate to high. The site is flooded to depths of 40 cm in the spring. The water table is within 50 cm of the soil surface in August and September. Soils remain moist through the summer except in drought years.

Vegetation Composition
Widefruit sedge is the dominant graminoid and forms a dense sward. Other sedges, rushes, and forbs are subordinant. Bluejoint reedgrass (*Calamagrostis canadensis*) and slimstem (*Calamagrostis neglecta*) reedgrasses form occasional colonies and tufted hairgrass is common on the dry end of the association. Kentucky bluegrass and Baltic rush are uncommon in climax stands but increase in cover on disturbed sites. Bladder sedge (*Carex utriculata*) and inflated sedge become common on wetter portions of the association. Forbs have low canopy cover and low plot frequency. Some of the more common forbs are small bedstraw (*Galium trifidum*) , large-leaf avens (*Geum macrophyllum*), Western polemonium (*Polemonium occidentale*), American bistort (*Polygonum bistortoides*), and longstalk clover (*Trifolium longipes*). Tall shrubs such as willows are uncommon.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Widefruit sedge (*Carex angustata*)	100	52	25-75
Baltic rush (*Juncus balticus)*	50	7	3-20
Inflated sedge (*Carex vesicaria*)	25	4	1-10
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa)*	75	8	1-15
Reedgrasses (*Calamagrostis* spp.)	58	8	1-35

Successional Dynamics

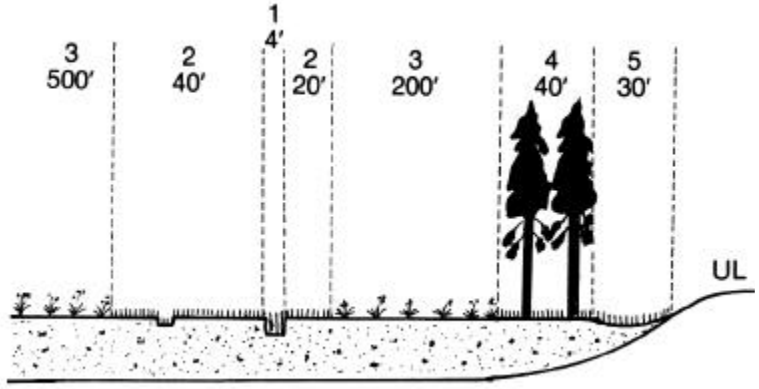
With overuse by ungulates, other graminoids and forbs become codominant with widefruit sedge. Season long grazing decreases the competitive ability of widefruit sedge, increasing the cover of Baltic rush, Kentuckybluegrass, Nebraska sedge (*Carex nebrascensis*), and forbs such as western yarrow (*Achillea millefolium*), western aster (*Aster spathulatum*), willoweeds (*Epilobium* spp.), small bedstraw (*Galium trifidum*), and western polemonium (*Polemonium occidentale*). The soil becomes somewhat broken and trampled. With continued overuse, other graminoids and forbs dominate widefruit sedge. On the Chiloquin Ranger District (Winema National Forest), Nebraska sedge occupies moist, overgrazed sites while sites with both overuse and lowered water tables have been converted to Kentucky bluegrass. Elsewhere, these conditions seldom occur because of the resiliency of widefruit sedge and because livestock avoid the wet soils until mid and late summer.

Some Widefruit sedge Association sites once supported lodgepole pine/widefruit sedge but the trees were killed in recent bark beetle epidemics or because of higher watertables.

Other Studies Documenting Association with Plot Data

Oregon: Kovalchik 1987:102; Volland 1976: 20 (in part);

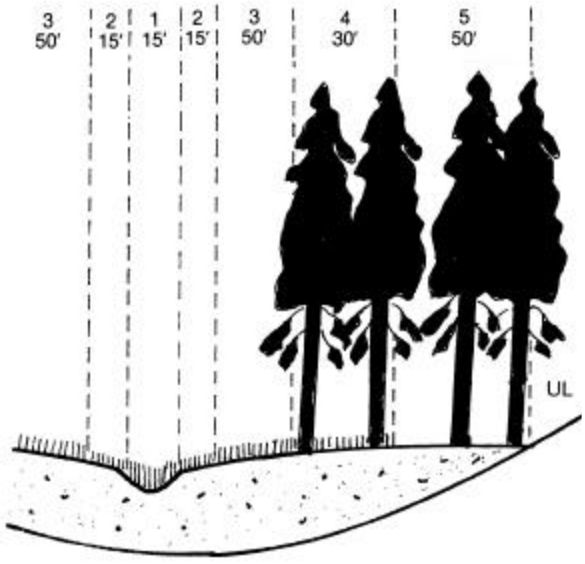
Illustrations



1. **Inflated sedge**, intermittent streambed
2. **Widefruit sedge**, moist meadow
3. **Tufted hairgrass**, dry meadow
4. **Lodgepole pine/widefruit sedge**, active floodplain
5. **Widefruit sedge**, cutoff/overflow channel

O'Connor Meadow; low gradient, modelevation basin, Pumice-mantled Basin and Range Physiographic Area, Winema National Forest.

1. Jack Creek, first-order
2. **Beaked sedge**, overflow channel
3. **Widefruit sedge**, active floodplain
4. **Lodgepole pine/widefruit sedge**, active floodplain
5. **Lodgepole pine/bearberry**, transition slope



Jack Creek; low gradient, mod elevation floodplain; Pumice-mantled Basin and Range Physiographic Area; Winema National Forest.

Carex aquatilis var. aquatilis (C. aquatilis) Association

Aquatic sedge Association
32 plots. CEGL001802

Ecoregional Range
BM, BR, EC

Environment and Soils
The Aquatic sedge Association occurs within the coniferous forest zones of the Blue Mountains, East Cascade and Basin and Range Ecoregions. It is found at moderate to high elevations (most sites are at higher elevations) in 20-350 m wide, low gradient, trough- and V-shaped valleys (sometimes in U- or flat-shaped) with gentle to moderately steep side slopes. Sites are to wet, flat, smooth or slightly concave meadows, on wet or active fluvial surfaces along floodplains. This association can also be found on silted-in beaver ponds, around springs, and along the margins of lakes. Where streams are present in the valley, they are C3, C4, C5, E4, E5 and E6 stream types. Stream widths are 0.5-10 m wide (most are 0.5-1.5 m wide). Soils range from silt loams to sandy loams on streambanks and freshly filled beaver ponds and organic loams or sedge peats in meadows, older beaver ponds, and basins. Mineral soils are fine-textured and have moderate to high water holding capacity. Site can be flooded to as much as 1 foot above the soil surface in May and June and are at least saturated to the surface well into the summer. The water table lowers to 40-50 cm below the soil surface late in the growing season. The *Carex aquatilis* association occurs on somewhat drier sites than the *Carex utriculata* association. Permanent flooding of a *Carex aquatilis* site by a beaver dam or other obstruction may change the site potential to *Carex utriculata*.

Valley Environment	Average	Range
Elevation (ft)	5281	3060-7470
Plot Slope (%)	4	0-30
Valley Width (m)	139	20-350
Valley Gradient (%)	4	1-30
Valley Sideslopes (%)	36	15-70
Soil Characteristics		
Depth of Current Water Tables (cm)	38	0-102
Thickness of Surface Organic Layer (cm)	37	8-127
Rooting Depth (cm)	61	23-127
Soil Surface Cover (%)		
Submerged	13	0-85
Bare Ground	19	0-100
Gravel	tr	0-2
Rock	1	0-15
Cryptogam	10	0-90
Litter	44	0-100

Adjacent Vegetation
Vegetation types adjacent to sites sampled in the Blue Mountains are: terraces - ponderosa pine-Douglas fir (*Pinus ponderosa-Pseudotsuga menziesii*) communities, lodgepole pine/Kentucky bluegrass (*Pinus contorta/Poa pratensis*) communities; sideslopes - grand fir-Engelmann spruce-lodgepole pine communities (*Abies grandis-Picea engelmannii-Pinus contorta*) and grand fir associations.

Vegetation Composition

Aquatic sedge has at least 25% cover or is the dominant graminoid and forms a dense sward. Willows, bog birch, and other shrubs are uncommon. A site on which the Aquatic sedge has formed an extremely dense network of rhizomes may exclude the establishment of willows and other shrubs, especially if the site experiences no seasonal flooding or flooding that does not deposit sufficient amounts fresh mineral substrate. Also, sites that are subjected to prolonged flooding or season-ong saturation may exclude willow establishment because some willow species cannot tolerate prolonged submersion of their root crowns (Esser 1992, Tesky 1992). Along the highly sinuous, very low gradient Rosgen E streams, the strong, dense root mass of aquatic sedge prevents the streambanks from developing the nickpoints or erosional areas needed for shrub establishment. Grasses such as tufted hairgrass, tall mannagrass (*Glyceria striata*) and meadow barley (*Hordeum brachyantherum*) are present but are subordinant to sedges. Other gramindois are common but are subordinant to aquatic sedge. Bladder sedge (*Carex utriculata*) and inflated sedge (*Carex vesicaria*) are common on wetter portions of the association. Understory herbs scattered through the stand including large-leaf avens, hairy willow-herb, western polemonium (*Polemonium occidentale*), musk monkey-flower (*Mimulus moschatus*), and Bog St. John's wort (*Hypericum anagalloides*). Average height of herbaceous vegetation is 56 cm, ranging from 31 to 91 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Aquatic sedge (*Carex aquatilis* var. *aquatilis*)	100	74	35-99
Smallfruit bulrush (*Scirpus microcarpus*)	38	5	1-12
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	38	4	1-10
PERENNIAL FORBS			
Hairy willow-herb (*Epilobium ciliatum*)	50	2	1-10
Large-leaf avens (*Geum macrophyllum*)	44	2	1-10

Successional Dynamics

If sites receive season-long grazing by ungulates the soil will become compacted and the sod broken apart, increasing the cover of Baltic rush, small sedges such as short-beaked sedge (*Carex simulata*) or Jones sedge (*Carex jonesii*), Kentucky bluegrass (*Poa pratensis*), and forbs. With increasing overuse by ungulates Baltic rush and short sedges become co-dominant with aquatic sedge. There is also a strong increase in mesic forbs such as western aster (*Aster spathulatum*), hairy willoweed, westerndock (*Rumex occidentalis*) , small bedstraw (*Galium trifidum*), or Longstalk clover (*Trifolium longipes*). Species richness is greater. The soils are broken and trampled. With continued overuse, rushes, forbs, and small sedges become dominant over aquatic sedge. Streambed downcutting may lower the water table and convert the site potential to Kentucky bluegrass or tufted hairgrass.

In areas where mountain pine beetles have killed populations of lodgepole pine or where the water table has been raised, many lodgepole pine/aquatic sedge sites have lost the lodgepole pine and been converted to the aquatic sedge association.

Other Studies Documenting Association with Plot Data

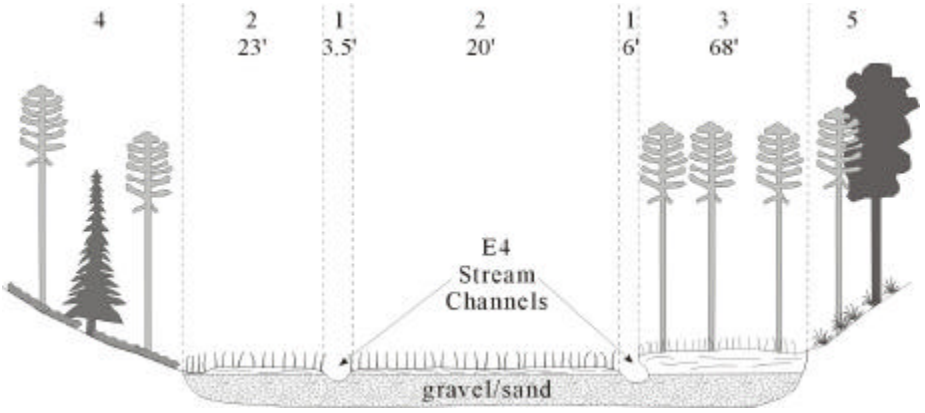
Oregon: Hall 1973:6; Volland 1976:20; Hopkins 1979:13; Kauffman 1982:59; Kauffman et al. 1985:16; Kovalchik 1987:104; Crowe & Clausnitzer 1997:174; Titus & Christy 1999.
Washington: Kovalchik 2001
Nevada: Manning & Padgett 1992
Montana: Hansen *et al.* 1995
Colorado: Kittel *et al.* 1999
Wyoming-eastern Idaho: Youngblood *et al.* 1985
Utah-eastern Idaho: Padgett *et al.* 1989

Other Studies Documenting Association without Plot Data

Oregon: Stuth 1975:66

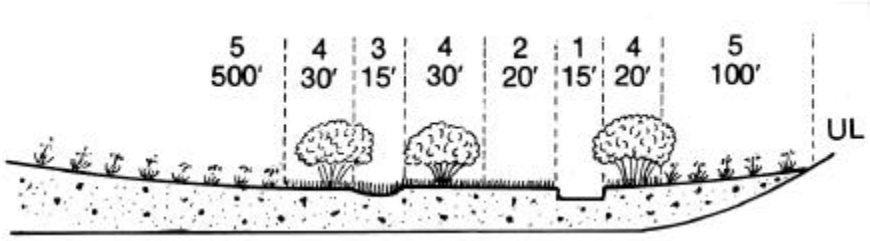
Illustrations

1. E4 stream reach
2. **Aquatic sedge**, floodplain
3. **Lodgepole pine/Cusick bluegrass**, terrace
4. Lodgepole pine-subalpine fir/grouse huckleberry, north-facing sideslope
5. Ponderosa pine-lodgepole pine/pinegrass, south-facing sideslope



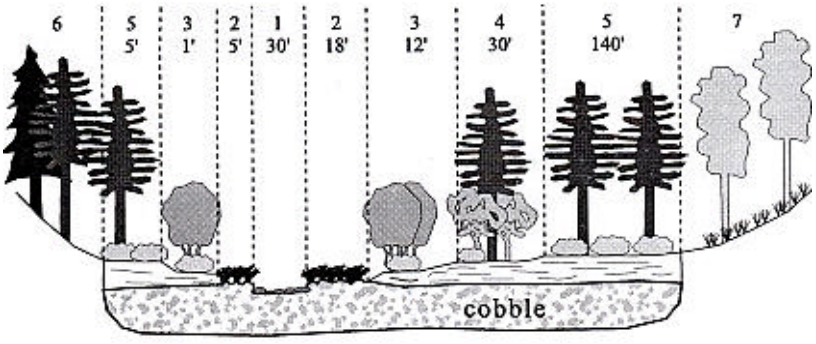
Summit Creek, Prairie City RD, Malheur NF; very low gradient, mod. high elevation, flat-shaped valley

1. Sycan River, second order
2. **Aquatic sedge**, active floodplain
3. **Aquatic sedge**, overflow channel
4. **Booth willow-Geyer's willow/aquatic sedge**, active floodplain
5. **Tufted hairgrass**, moist meadow



Sycan River Meadow; low gradient,mod-high elevation basin; Fremont National Forest.

1.Cougar Creek, first-order
2.**Aquatic sedge**, active channel shelves and streambanks
3.**Lodgepole pine/aquatic sedge**, inactive and active floodplains
4.Terraces without measurable water tables or transitional vegetation



Cougar Creek; mod-low gradient,mod-high elevation floodplain; Fremont National Forest.

Carex aquatilis var. dives (C. sitchensis) Association

Sitka sedge Association
25 plots. CEGL001826

Ecoregional Range
CR, EC, WC

Environment and Soils
The Sitka sedge association is most common on low gradient floodplain landforms along the Deschutes River and its major tributaries in the LaPine Basin Physiographic Area. It also occurs on similar landforms along Indian Ford Creek in the Low Flanks Cascades Physiographic Area. The Sitka sedge association also occurs in flat, headwater basins such as Seven-mile Marsh, Big Marsh, Sparks Lake Marsh, and the many marshes between Santiam Pass and Mt. Washington in the Deschutes and Winema Cascades Physiographic Areas. Elevations are low to moderately high, ranging from 3100 feet along Indian Ford Creek and 4000 feet along the Deschutes River to 5700 feet in Sevenmile Marsh.

Valley Environment	Average	Range
Elevation (ft)	4824	4150-5500
Plot Slope (%)	1	0-2
Valley Gradient (%)	2	1-2
Soil Characteristics		
Current Water Table Depth (cm)	+21	+55-10
Thickness of Surface Organic Layer (cm)	55	45-65
Soil Surface Cover (%)		
Submerged	12	0-98
Bare Ground	39	0-90
Cryptogam	3	0-15
Litter	45	0-100

Soils along floodplains are deep alluviums that are high in organics. Surface textures are fine sandy to organic loams. Marsh soils are deep sedge peats. Available water holding capacity is moderate to high. Water tables are normally near to well above the soil surface for much of the summer. Some of the watersheds in which this association occurs, especially the Deschutes River, may have peak water flow in August because it takes several months for snowmelt to work through the deep volcanic mantle of the Cascades.

Vegetation Composition
The association is dominated by a sward of Sitka sedge. Other graminoids become significant only where the Sitka sedge association is ecotonal to otherassociations such as bladder sedge (*Carex utriculata*) or widefruit sedge (*Carex angustata*). Willows were present in small amounts on several plots, indicating that lowering of the water table through soil deposition or stream downcutting may change site potential to the willow/Sitka sedge association.

Adjacent Vegetation
The Sitka sedge Association occurs within a matrix of wet basin associations, including Lodgpole pine/Bog blueberry, Lodgepole pine/Grouse huckleberry, Bog blueberry/Sitka sedge and Few-flowered spikerush Associations.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Geyer's willow (*Salix geyeriana*)	29	4	1-7
SEDGES and RUSHES			
Sitka sedge (*Carex aquatilis* var. *dives*)	100	70	37-95
Bladder sedge (*Carex utriculata*)	35	5	2-5
Baltic rush (*Juncus balticus*)	24	11	1-25
PERENNIAL GRASSES			
Bluejoint reedgrass (*Calamagrostis canadensis*)	29	4	1-15
Weak alkaligrass (*Torreyochloa pallida* var. *pauciflora*)	24	3	1-5
PERENNIAL FORBS			
Bog buckbean (*Menyanthes trifoliata*)	24	5	1-10
Small cleavers (*Galium trifidum*)	24	1	1-2
Water hemlock (*Cicuta douglasii*)	18	3	1-5

Successional Dynamics

With overuse by grazing ugulates, grasses and forbs become codominant with Sitka sedge. With continued overuse, streambed downcutting may lower water tables, converting site potential to drier associations such as widefruit sedge (*Carex angustata*).

Other Studies Documenting Association with Plot Data

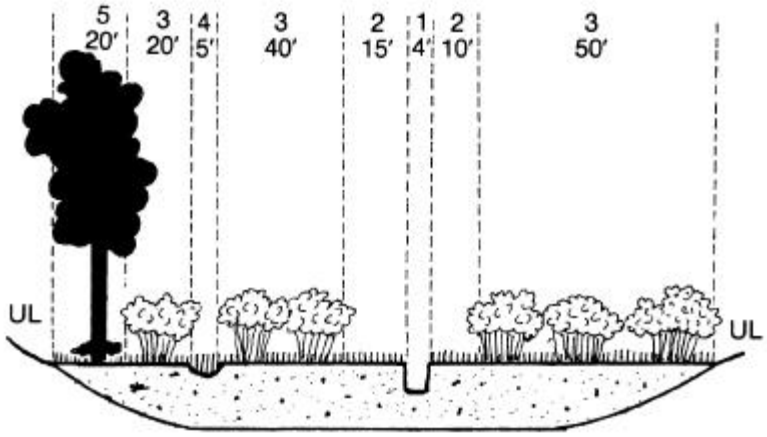
Oregon: Campbell 1973:41; Seyer 1979:39; Frenkel et al. 1986:33; Wilson 1986:19; Hemstrom et al. 1987:255; Kovalchik 1987:114; Kunze 1994:27, 84; Murray 2000
Washington: Kovalchik 2001 (as part of *Carex aquatilis* Association)
Alaska: Boggs 2000

Other Studies Documenting Association without Plot Data

Oregon: Roach 1952:184; Seyer 1983:12; Titus 1996; Titus & Christy 1996a, 1999

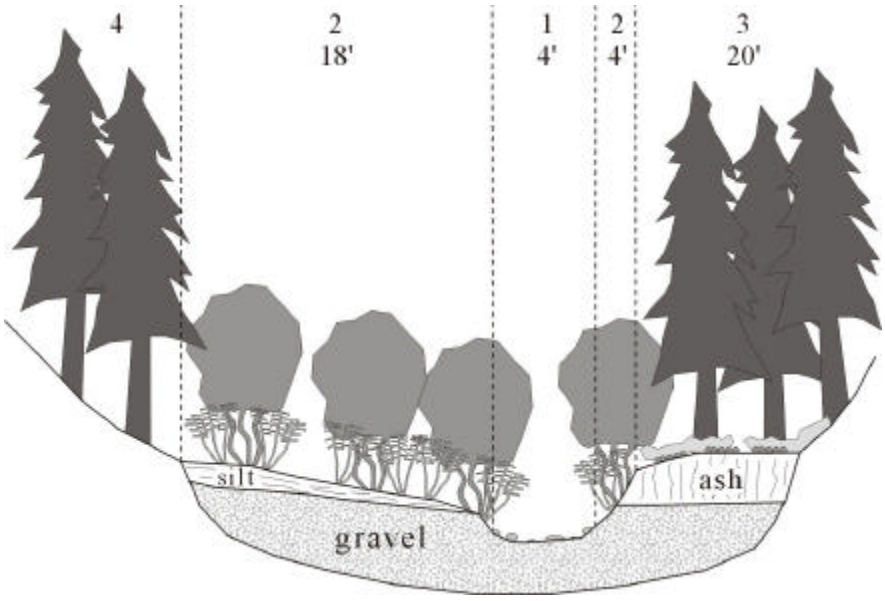
Illustrations

1. Indian Ford Creek, second order
2. **Sitka sedge**, active floodplains
3. **Willow/Sitka sedge**, active floodplains
4. **Beaked sedge**, overflow channels
5. **Quaking aspen-lodgepole pine/Douglas spiraea/widefruit sedge**, transition slope



Indian Ford Creek; low gradient, low elevation floodplain; Low Flanks Cascades Physiographic Area.

1. Deschutes River, fifth-order
2. **Sitka sedge**, active floodplain
3. **Beaked sedge**, overflow channels and active channel shelves
4. **Willow/Sitka sedge**, active floodplains
5. **Lodgepole pine/Douglas spiraea/widefruit sedge**, inactive floodplains



Deschutes River; low gradient, low elevation floodplain; LaPine Basin Physiographic Area.

Carex breweri Association

Brewer's sedge Association
4 plots. CEGL001805

Ecoregional Range
EC, WC

Environment and Soils
The Brewer sedge associationœ is locally abundant in subalpine and alpine settings, primarily in the Deschutes Cascades Physiographic Area. It has been observed only in the Three Sisters Wilderness Area (Deschutes National Forest) and Crater Lake National Park but may occur on other high Cascade Mountains having thick mantels of ash and pumice. Elevations are 6500 to 7000 feet. It occurs on very low gradient, internally drained meadows, drainages, and basins where snowmelt is late and the snow free season is fewer than 3 months long.

Valley Environment	Average	Range
Elevation (ft)	6705	6550-6800
Plot Slope (%)	0.5	0-1
Soil Surface Cover (%)		
Bare Ground	41	35-45
Gravel	41	35-55
Rock	1	0-2
Cryptogam	10	0-25
Litter	7	0-20

The soil is composed of pumice alluvium. Surface textures range from loamy sand to coarse sandy loam and grade into a coarse pumice C horizon. Available water holding capacity is low. Soils are briefly saturated at snowmelt, but the water table lowers to more than 5 feet below the soil surface by September.

Vegetation Composition
Brewer sedge forms a loose sod in which other herbs are inconspicuous. Drummond rush, black alpine sedge, and Mt. Shasta sedge (*Carex straminiformis*) are present but have little cover. The most consistent forbs are alpine pussytoes, alpine aster, and alpine pussypaws. Species richness is low. Dwarfed lodgepole pine are widely scattered in the association but show little ability to dominate the site as in the red mountain heath association. Bare ground is conspicuous between the small clumps of Brewer's sedge.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
UNDERSTORY TREES			
Lodgepole pine (*Pinus contorta*)	75	2	1-3
SEDGES and RUSHES			
Brewer's sedge (*Carex breweri*)	100	41	30-55
Drummond's rush (*Juncus drummondii*)	100	2	1-5
Black alpine sedge (*Carex nigricans*)	100	2	1-3
PERENNIAL FORBS			
Umber pussytoes (*Antennaria umbrinella*)	75	3	--
Alpine pussypaws (*Cistanthe umbellata*)	75	2	--
Alpine aster (*Oreostemma alpigenum* var. *alpigenum*)	75	2	1-2
Littleflower penstemon (*Penstemon procerus*)	50	2	--
Newberry's polygonum (*Polygonum davisiae*)	50	2	1-3

Successional Dynamics

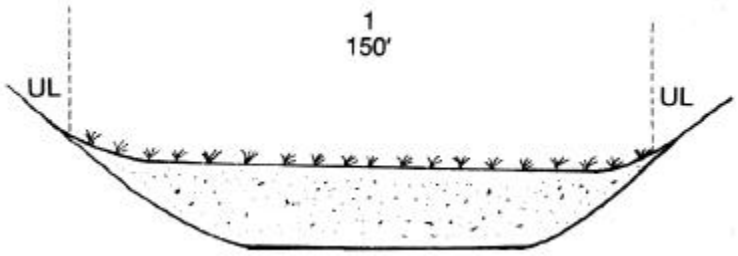
Where sites are grazed the association there is greater cover of bare ground and less total canopy cover. Trampling probably is the biggest factor on reducing condition and not forage utilization itself. With increasing overgrazing, Brewer's sedge is still dominant (15-30 percent canopy cover) although total plant cover is decreasing. Other graminoids and herbs increase only slightly, even on poor condition sites. Bareground occurs in open, scattered patches. The soil surface becomes somewhat broken, trampled,and compacted. With continued overuse, Brewer's sedge and other herbs develop broken, erratic distributions within large patches of bare ground. Pedestaling of Brewer's sedge may be evident. The soil surface becomes very broken and trampled. Sites in mid seral ecological status will improve very slowly, even with complete exclosure.

Other Studies Documenting Association with Plot Data

Oregon: Kovalchik 1987: 126
Washington: Douglas and Bliss 1977: 119

Illustrations

1. Brewer sedge, dry meadow



Unnamed drainage near Round Meadow;low gradient, subalpine drainage; Deschutes Cascades Physiographic Area.

Carex buxbaumii Association

Buxbaum's sedge Association
5 plots. CEGL001806

Ecoregional Range

EC

Environment and Soils

This association occurs in the northwestern corner of Big Marsh, Deschutes National Forest. The sample plots are at 4,700 feet elevation, with a slope of 1%. This plant association is found on stream orders 1 and 2.

Vegetation Composition

Cover and richness are low in this association. Mean percent cover is 71%, ranging from 60-89%. Mean richness is 8.8, ranging from 4-12.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Bog blueberry (*Vaccinium uliginosum)*	40	0.1	0-0.4
SEDGES and RUSHES			
Buxbaum's sedge (*Carex buxbaumii)*	100	49	35-70
Creeping spikerush (*Eleocharis palustris*)	40	2	0-12
Few-flowered spikerush (*Eleocharis quinqueflora*)	40	0.4	0-1
Nevada sedge (*Juncus nevadensis*)	40	2	0-8
Baltic rush (*Juncus balticus*)	40	0.7	0-3
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa)*	80	6	0-25
PERENNIAL FORBS			
Northern bugleweed (*Lycopus uniflorus)*	80	6	0-20
Bog St. John's wort (*Hypericum anagalloides)*	40	2	0-10
Flatleaf bladderwort (*Utricularia intermedia)*	20	2	0-10

Other Studies Documenting Association with Plot Data

Oregon: Titus and Christy 1996a, 1999
Utah and southeastern Idaho: Padgett *et al.* 1989

*Carex canescens Association**

Grey sedge Association
2 plots. New type

Ecoregional Range
BM, EC, WC

Environment and Soils
The two sites sampled were in the mid Blue Mountains at moderate elevations (4120-4920 ft.) in very low gradient, narrow to wide, trough- and V-shaped valleys. One site was a spring and the other was a wet headwater basin. The water table is at or near the soil surface throughout the year and one one site 60% of the surface was submerged at the time of sampling. Soils are organic or very organic rich. This plant association is found on stream orders 1 and 2.

Vegetation Composition
Silvery sedge is very dominant. Other forbs and graminoids are scattered over a dense moss cover (35-90%). Mean percent cover is 165%, ranging from 142-188%. Mean richness is 12.5, ranging from 9016. Average height of herbaceous vegetation is 38 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Silvery sedge (*Carex canescens*)	100	89	80-98
Swordleaf rush (*Juncus ensifolius*)	100	6	1-12
Baltic rush (*Juncus balticus)*	100	1	--
PERENNIAL GRASSES			
Slender muhly (*Muhlenbergia filiformis*)	50	40	--
Tufted hairgrass (*Deschampsia caespitosa)*	50.	12	--
PERENNIAL FORBS			
Sweetmarsh butterweed (*Senecio hydrophiloides*)	50	30	--
Green false-hellebore (*Vertrum viride*)	50	4	--

Adjacent Vegetation
This association occurs in wet meadow complexes with the Aquatic sedge (*Carex aquatilis*) Association, the Tufted hairgrass Association and other similar types. Upland vegetation adjacent to sites sampled are: subalpine fir/grouse huckleberry (*Abies lasiocarpa/Vaccinium scoparium*) and other subalpine fir associations.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997: 199

Other Studies Documenting Association without Plot Data
Oregon: Seyer 1983: 8 (in part); Titus and Christy 1996a, 1999

Carex cusickii Association

Cusick's sedge Association
11 plots. CEGL000230

Ecoregional Range
BM

Environment and Soils
The Cusick's sedge association occurs at moderate elevations throughout the Blue Mountains. It is a minor type found in narrow to wide, low to moderate gradient, trough-, U- and V-shaped valleys with gentle to moderately steep side slopes. Sites are wet basins (fens), springs, and floodplains. All sites appear to receive groundwater from within the site or from an adjacent spring source. On three sites there were narrow (less than 1.5 m wide) Rosgen E6 and "E7" (organic channel substrate) streams with little organic debris affecting the channels. Soils are almost always organic (Borofibrists, Borohemists, and Borosaprists) although two sites had Mollisols (Endoaquolls). The soils are saturated to the surface well into the summer. The water table remains within 30 cm of the soil surface throughout the year. Coarse fragments, when present in the soil, were deep ranging from 78-122 cm deep.

Valley Environment	Average	Range
Elevation (ft)	4587	4050-5280
Plot Slope (%)	2	1-8
Valley Width (m)	124	2-5
Valley Gradient (%)	3	20-350
Valley Sideslopes (%)	31	15-45
Soil Characteristics		
Depth of Current Water Table (cm)	19	0-61
Rooting Depth (cm)	71	17-99
Thickness of Surface Organic Layer (cm)	31	15-64
Soil Surface Cover (%)		
Submerged	3	0-12
Bare Ground	1	0-5
Cryptogam	29	0-93
Litter	65	5-100

Vegetation Composition
Cusick's sedge forms large tufts and generally has very high cover on the site. A variety of other herbaceous species can be present from site to site, the most constant being western polemonium, bog saxifrage, and white bog-orchid. Average height of herbaceous vegetation is 62 cm, ranging from 30 to 90 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Cusick's sedge (*Carex cusickii*)	100	77	30-100
Bladder sedge (*Carex utriculata*)	55	8	3-20
PERENNIAL FORBS			
Western polemonium (*Polemonium occidentale*)	73	4	1-10
Large-leaf avens (*Geum macrophyllum*)	36	20	5-35
Bog saxifrage (*Saxifraga oregana*)	36	7	5-8
White bog-orchid (*Habenaria dilatata*)	36	4	3-4

Adjacent Vegetation

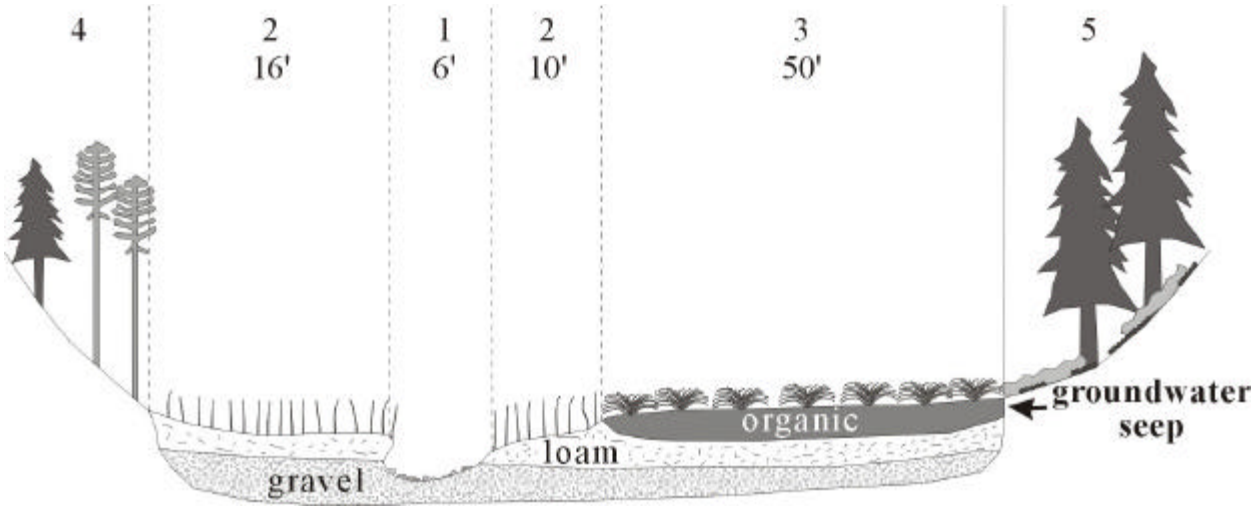
Adjacent vegetation types are: terraces - Lodgepole pine (*Pinus contorta*) communities, Ponderosa pine (*Pinus ponderosa*) and Douglas fir (*Psetudotsuga menziesii*) associations; sideslopes - Grand fir/grouse huckleberry-twinflower (*Abies grandis/Vaccinium scoparium-Linnaea borealis*) Association, Grand fir/twinflower (*Abies grandis/Linnaea borealis*) Association, Grand fir/pinegrass (*Abies grandis/Calamagrostis rubescens*) Association, Ponderosa pine/Idaho fescue-bluebunch wheatgrass (*Pinus ponderosa/Festuca idahoensis-Pseudoroegneria spicata*) and other Douglas-fir and ponderosa pine associations.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997: 176; Murray 2000
Washington: Kovalchik 1991

Illustrations

1.C4 stream reach
2.**Bladder sedge**, floodplain
3.**Cusick's sedge**, seep-located on floodplain
4.Lodgepole pine-grand fir, southeast-facing sideslope
5.Grand fir/grouse huckleberry-twinflower, northwest-facing sideslope



Waucup Creek, La Grande RD, Wallowa-Whitman NF; very low gradient, mod. elevation, flar-shaped valley.

*Carex echinata (C. muricata) Association**

Star sedge Association
3 plots. New type

Ecoregional Range
BM, EC, WC

Environment and Soils
Sites were sampled at moderate to high elevations (4395-7030 ft.) in headwater basins in the Elkhorn and Strawberry Mountains. This association generally occurs in small patches within these wet basins. Soils are peats (hemic and fibric histosols) with deep organic surface layers (76 cm+) that are saturated throughout the growing season.

Valley Environment	Average	Range
Elevation (ft)	6052	4395-7030
Plot Slope (%)	2	1-3
Valley Width (m)	65	30-100
Valley Gradient (%)	4	2-5
Valley Sideslopes (%)	15	--
Soil Characteristics		
Current Water Table Depth (cm)	26	0-51
Soil Surface Cover (%)		
Submerged	8	0-23
Bare Ground	1	0-2
Cryptogam	72	50-90
Litter	18	0-45

Vegetation Composition
Star sedge dominates the site with a few scattered graminoids and forbs, including alpine shooting star, few-flowered spikerush, and aquatic sedge. Average height of herbaceous vegetation is 26, ranging from 23 to 31 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Star sedge (*Carex echinata*)	100	65	55-80
Few-flowered spikerush (*Eleocharis quinqueflora*)	67	23	15-30
Aquatic sedge (*Carex aquatilis*)	67	11	1-20
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	67	1	--
PERENNIAL FORBS			
Alpine shooting star (*Dodecatheon alpinum*)	67	9	3-15
White bog-orchid (*Habenaria dilatata*)	67	1	--

Adjacent Vegetation
The star sedge association occurs within a mosaic of wet meadow associations, including the Tufted hairgrass (*Deschampsia caespitosa*), Aquatic sedge (*Carex aquatilis* var. *aquatilis*), and the Few-flowered spikerush (*Eleocharis quinqueflora)* Associations. Upland vegetation types adjacent to meadows are subalpine fir/grouse huckleberry and other subalpine fir associations.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997: 1999

Other Studies Documenting Association without Plot Data
Oregon: Seyer 1983: 8 (in part)

*Carex interrupta Association**

Green-fruited sedge Association
2 plots. New type

Ecoregional Range
EC

Environment and Soils
Two sample plots were located in wet, subalpine basins and meadows at 5600 ft. elevation in the Three Sisters and Mount Jefferson Wilderness Areas (Deschutes National Forest). Elevations appear to be above the limits of closely related sedges such as widefruit sedge (*Carex eurycarpa*) and Sitka sedge (*Carex aquatilis var. dives*). Plot slopes averaged 8% (ranging from 0-15%). Sites are more permanently saturated than the Holm's sedge (*Carex scopulorum*) Associations. Soils have histic (sedge peat) epipedons (upper horizons) with surface organic layers averaging 20 cm thick (ranging from 10-30 cm).

Vegetation Composition
Green-fruited sedge is the dominant herbaceous species on both plots.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Green-fruited sedge (*Carex interrupta*)	100	35	20-50
Brown sedge (*Carex subfusca*)	50	20	--
PERENNIAL GRASSES			
Slender muhly (*Muhlenbergia filiformis*)	50	15	--
Thin bentgrass (*Agrostis pallens*)	50	5	--
PERENNIAL FORBS			
Gorman's buttercup (*Ranunculus gormanii*)	50	15	--
Bog St. John's wort (*Hypericum anagalloides*)	50	3	--
Longstalk clover (*Trifolium longipes*)	50	3	--
Western St. John's wort (*Hypericum scouleri*)	50	3	--

Other Studies Documenting Association with Plot Data
Oregon: Kovalchik 1987: 138

*Carex laeviculmis Association**

Smooth stemmed sedge Association
1 plots. New type

Ecoregional Range
BM

Environment and Soils
This community was sampled on a floodplain on Dry Fork Beaver Creek on La Grande RD (Wallowa-Whitman NF). The valley in which this site occurs is narrow, low gradient and V-shaped. The soil is very moist throughout the year. The water table was at 38 cm depth at the time sampling and 80% coarse fragments are present at 44 cm depth. The stream adjacent to the sample site is a narrow, moderate gradient C5 Rosgen stream type.

Vegetation Composition
Smooth-stemmed sedge forms a dense stand with a rich mixture of forbs and graminoids growing throughout the site, including swamp onion, common cowparsnip, western polemonium, arrowleaf groundsel, small-winged sedge, tall mannagrass, and Thurber bentgrass. Moss cover was 86%. Average height of herbaceous vegetation is 30 cm.

Dominant Species	Canopy Cover (%)
SEDGES and RUSHES	
Smooth-stemmed sedge (*Carex laeviculmis*)	80
Small-winged sedge (*Carex microptera*)	11
PERENNIAL GRASSES	
Tall mannagrass (*Glyceria striata*)	12
Thurber's bentgrass (*Agrostis humilis*)	4
PERENNIAL FORBS	
Swamp onion (*Allium validum*)	17
Common cowparsnip (*Heracleum maximum*)	15
Western polemonium (*Polemonium occidentale*)	6
Arrowleaf groundsel (*Senecio triangularis*)	5
Great North aster (*Canadanthus modestus*)	4
Sweet-scented bedstraw (*Galium triflorum*)	4

Adjacent Vegetation
Adjacent upland vegetation is grand fir/grouse huckleberry, grand fir/grouse huckleberry and grand fir/twinflower (upper slopes).

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997: 212.

Carex lasiocarpa Association

Slender sedge Association
31 plots. CEGL001810

Ecoregional Range
BM, BR, EC

Environment and Soils
The slender sedge association is locally abundant at moderate elevations (4600-5700 feet) in the Pumice-mantled Basin and Range, LaPine Basin,Winema Cascades, and Deschutes Cascades Physiographic Areas. This association covers several square km of Big Marsh in the Descutes National Forest. Two plots are located at Duck Lake in the southern Wallowa Mountains. The association occurs on poorly drained landforms in flat basins and along lakeshores that are anaerobically favorable to the buildup of deep organic soils. The marsh and lake sites support deep sedge and sedimentary peat soils, respectively. Available water holding capacity is high. The soil surface is often flooded into July and August and water tables are within 50 cm of the soil surface in September except in drought years.

Valley Environment	Average	Range
Elevation (ft)	4950	4600-5400
Plot Slope (%)	1	0-5
Valley Width (m)	350	1-5
Valley Gradient (%)	3	--
Valley Sideslopes (%)	45	--
Soil Characteristics		
Current Water Table Depth (cm)	24	+5-51
Thickness of Surface Organic Layer (cm)	44	20-55
Soil Surface Cover (%)		
Submerged	33	0-98
Bare Ground	30	0-90
Gravel	5	0-37
Rock	2	0-15
Cryptogam	1	0-5
Litter	51	2-97

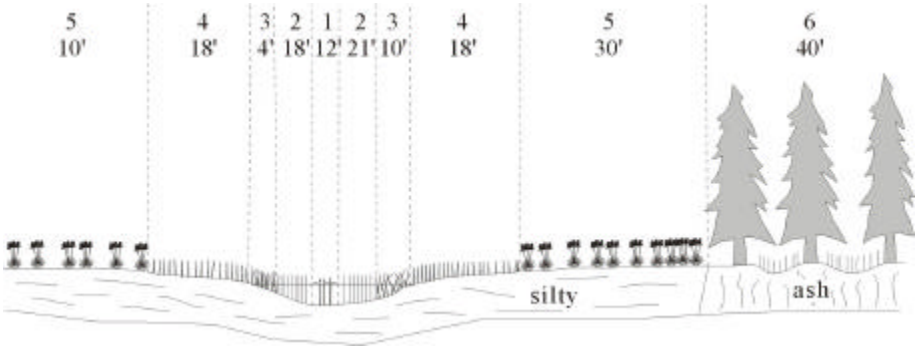
Vegetation Composition
Slender sedge dominates other graminoids and forbs. Grasses such as tufted hairgrass and slimstem reedgrass (*Calamagrostis neglecta*) are a minor component of the stand. Baltic and Nevada sedge (*Juncus nevadensis*) are subordinant to slender sedge and forbs are scarce. However, aquatic forbs such as pondweed and bladderwort may be common while the site is flooded in June and July. Mean percent cover is 72, ranging from 30-107%, with only two plots achieving cover values >100. Mean richness if 5.7, ranging from 1-31. Only one plot has richness > 11. Average height of herbaceous vegetation is 46 cm, ranging from 31 to 61 cm.

Other Studies Documenting Association with Plot Data
Oregon: Kovalchik 1987: 109; Crowe and Clausnitzer 1997: 200; Titus and Christy 1996a, 1999
Washington: Kovalchik 2001
Montana: Hansen *et al.* 1995
Utah and eastern Idaho: Padgett *et al.* 1989

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Slender sedge (*Carex lasiocarpa*)	100	50	15-100
Baltic rush (*Juncus balticus*)	39	5	tr-25
Bladder sedge (*Carex utriculata*)	26	9	tr-30
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	55	3	tr-10
PERENNIAL FORBS			
Western aster (*Aster spathulatum*)	29	4	tr-15
Small cleavers (*Galium trifidum*)	19	tr	tr-1
Flatleaf bladderwort (*Utricularia intermedia)*	13	5	tr-12
Grass-leaved pondweed (*Potamogeton gramineus*)	13	2	tr-6

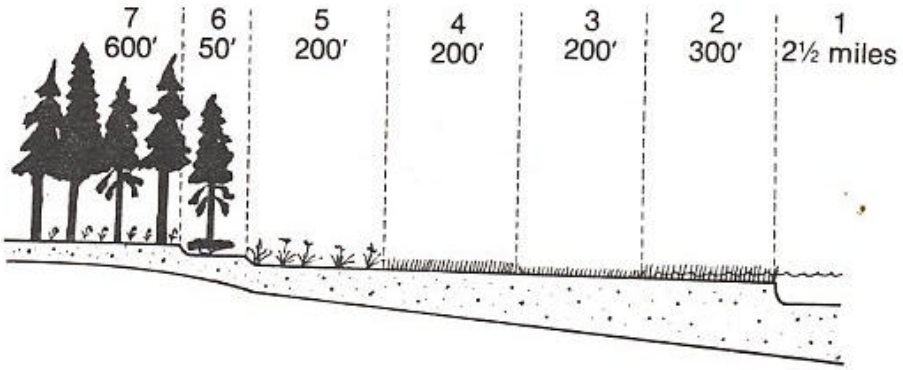
Illustrations

1.Big Marsh Creek, second-order
2.**Beaked sedge**, active channel shelves and overflow channels
3.**Tufted hairgrass**, moist meadows
4.**Slender sedge**, wide, shallow overflow channels, and poorly drained flats
5.**Lodgepole pine/tufted hairgrass** forested wetland
6.Engelmann spruce/queencup beadlily, transition slopes



Big Marsh; flat, mod elevation basin; Deschutes Cascades Physiographic Area.

1. Lake of the Woods
2. **Inflated sedge**, permanently flooded shore
3. **Nevada rush**, semi-permanently flooded shore
4. **Slender sedge**, semi-permanently flooded shore
5. **Tufted hairgrass**, moist meadow
6. **Lodgepole pine/bog blueberry/widefruit sedge**, forested wetland
7. Engelmann spruce/queencup beadlily, terrace



Lake of the woods; flat, mod elevation lake basin; Winema Cascades Physiographic Area.

Carex lenticularis Association

Lenticular sedge Association
9 plots. New type

Ecoregional Range

BM, EC, WC

Environment and Soils

The CALEL2 association is found at moderate to high elevations in narrow to wide, low to moderately high gradient, V-shaped valleys with moderately steep to steep side slopes. Sites are wet basins, floodplains, and occasionally springs. Streams sampled were C4 Rosgen types that were 0.5-10 m wide. Soils are young, poorly developed alluvial deposits (Mollic and Typic Endoaquents) with fine to coarse textures. Some are shallow to buried stream beds. Surfaces may be flooded during late spring runoff, but the water table drops to 30-50 cm below the soil surface by late summer. This association occurs on stream orders 1, 2 and 3.

Valley Environment	Average	Range
Elevation (ft)	4891	3800-6840
Plot Slope (%)	2	1-7
Valley Width (m)	75	5-200
Valley Gradient (%)	4	2-7
Valley Sideslopes (%)	53	45-70
Soil Surface Cover (%)		
Submerged	2	0-5
Bare Ground	12	0-40
Gravel	6	0-40
Rock	9	0-82
Cryptogam	20	0-77
Litter	20	0-100

Vegetation Composition

Densely-tufted sedge cover varies from 25-95%. Other graminoids, such as small-winged sedge, creeping spikerush (*Eleocharis palustris*), small-fruit bulrush (*Scirpus microcarpus*), and tufted hairgrass may be co-dominant with densely-tufted sedge. Common forbs include field mint, musk monkey-flower, western polemonium, and various asters, buttercups, and clovers. The area occupied by the densely-tufted sedge association in a valley is generally small. Average height of herbaceous vegetation is 30 cm, ranging from 26 to 36cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Densely-tufted sedge (*Carex lenticularis*)	100	40	15-95
Small-winged sedge (*Carex microptera*)	78	4	tr-8
Baltic rush (*Juncus balticus*)	44	13	3-35
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	44	13	1-25
Tufted hairgrass (*Deschampsia caespitosa*)	33	25	10-35
PERENNIAL FORBS			
Western yarrow (*Achillea millefolium*)	44	3	1-10
Field mint (*Mentha arvensis*)	33	7	3-15
Large-leaf avens (*Geum macrophyllum*)	33	3	1-6
Northwest cinquefoil (*Potentilla gracilis*)	33	3	1-5
American speedwell (*Veronica americana*)	33	2	tr-5
Musk monkey-flower (*Mimulus moschatus*)	33	1	1-2
Hairy willow-herb (*Epilobium ciliatum*)	33	1	1-2

Adjacent Vegetation

Adjacent sideslope vegetation types are: subalpine fir/big huckleberry (*Abies lasiocarpa/Vaccinium membranceum*), grand fir/big huckleberry (*Abies grandis/Vaccinium membranaceum*), Douglas fir/mallow ninebark (*Pseudotsuga menziesii/Physocarpus malvaceus*), Douglas fir/common snowberry (*Symphoricarpos albus)*, Douglas fir/pinegrass (*Calamagrostis rubescens*), and lodgepole pine (*Pinus contorta*)-grand fir communities.

Successional Dynamics

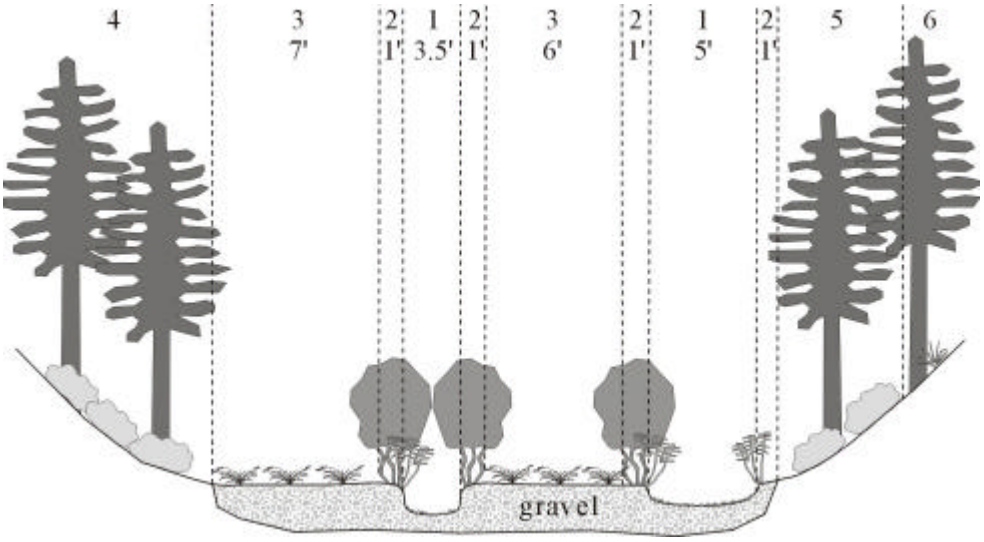
If the sediments on which this association occurs remain intact for long enough periods of time this association may succeed to the Mountain alder (*Alnus incana*)/Densely-tufted sedge Association.

Other Studies Documenting Association with Plot Data

Oregon: Diaz and Mellon 1996: 151; Crowe and Clausnitzer 1997: 184; Murray 2000
Washington: Titus *et al.* 1997; Henderson and Peter 1982: 78; Kovalchik 2001

Illustrations

1. B4 stream reach channels
2. **Mountain alder-currants/mesic forb**, banks
3. **Densely-tufted sedge**, floodplain
4. Douglas-fir/common snowberry, south-facing sideslope
5. Douglas-fir/common snowberry, north-facing toeslope
6. Douglas-fir/pinegrass, north-facing sideslope



Little Crane Creek, Prairie City RD, Malheur NF; mod. low gradient, mod. elevation, V-shaped valley

*Carex leporinella Association**

Sierra hare-sedge Association
3 plots. New type

Ecoregional Range
BM, EC

Environment and Soils
This association occurs at high elevations within wet meadows that contain meandering streams. Sites are old oxbows that are have filled in with sediments and are only about 30-50 cm below the surface of the surrounding meadow. These sites collect water after the spring snowmelt but standing water percolates into the soil or evaporates by late in the growing season. Soils are mineral with silt loam to organic peat (fibric) surface horizons. Strong redoximorphic features are seen at 10-15 cm below the soil surface indicating season-long saturation.

Valley Environment	Average	Range
Elevation (ft)	7120	6780-7350
Plot Slope (%)	1	--
Valley Width (m)	110	65-200
Valley Gradient (%)	2	--
Valley Sideslopes (%)	53	45-70
Soil Surface Cover (%)		
Submerged	18	0-35
Bare Ground	20	0-40
Litter	55	20-90

Vegetation Composition
Average height of herbaceous vegetation is 17 cm, ranging from 13 to 20 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Sierra hare-sedge (*Carex leporinella*)	100	87	70-95
Aquatic sedge (*Carex aquatilis*)	33	80	--
PERENNIAL GRASSES			
Slender muhly (*Muhlenbergia filiformis*)	33	1	--
Tufted hairgrass (*Deschampsia caespitosa*)	33	1	--
PERENNIAL FORBS			
American bistort (*Polygonum bistortoides*)	33	1	--
Elephant's head (*Pedicularis groenlandica*)	33	1	--

Adjacent Vegetation
This association occurs within wet meadow complexes, often adjacent to the Holm's sedge (*Carex scopulorum*), Aquatic sedge (*Carex aquatilis* var. *aquatilis*), Few-flowered spikerush (*Eleocharis quinqueflora)* and Undergreen willow (*Salix commutata*)/Holm's sedge Associations. Adjacent upland vegetation comprises Subalpine fir (*Abies lasiocarpa*) associations.

Successional Dynamics
As these sites continue to fill in with sediments over time, they will convert to the adjacent meadow association, most likely Holm's sedge (*Carex scopulorum*) or Aquatic sedge (*Carex aquatilis* var. *aquatilis*).

Other Studies Documenting Association without Plot Data
Oregon: Seyer 1981: 17; Titus and Christy 1996a, 1999

Carex luzulina Association

Woodrush sedge Association
13 plots. New type

Ecoregional Range
BM, EC

Environment and Soils
The CALU association occurs in headwater basins and alluvial valleys that are moderately wide, low gradient, and trough-shaped with gentle side slopes. Sites are headwater basins and occasionally floodplains. Where streams were flowing through the meadows, they were narrow (less than 1.5 m wide) Rosgen E6 types. Soils are Mollisols and Histosols. Most soils have at least a surface peat (fibric or hemic) horizon. Soil mineral textures are silty clay, silt loam, and loam and have high water-holding capacities. Sites are rarely saturated during the growing season.

Valley Environment	Average	Range
Elevation (ft)	6303	5000-7580
Plot Slope (%)	4	1-20
Valley Width (m)	105	20-200
Valley Gradient (%)	6	2-20
Valley Sideslopes (%)	31	15-70
Soil Characteristics		
Current Water Table Depth (cm)	65	25-110
Depth to Redoximorphic Features (cm)	20	0-45
Rooting Depth (cm)	21	10-36
Thickness of Surface Organic Layer (cm)	36	2-100
Soil Surface Cover (%)		
Submerged	2	0-8
Bare Ground	8	0-50
Rock	1	0-5
Cryptogam	46	2-98
Litter	25	2-75

Vegetation Composition
Wood-rush sedge cover ranges from 25% to 95% or is the dominant graminoid. Various other graminoids may be abundant on the site, including Jones' sedge, field woodrush, aquatic sedge, tufted hairgrass, slender muhly, and alpine timothy. Forbs commonly present are bog St. John's wort, Jeffrey's shooting star, alpine shooting star (*Dodecatheon alpinum*), alpine meadow butterweed, white bog-orchid (*Habenaria dilatata*), and long-stalked clover (*Trifolium longipes*). Moss cover is generally very high. Average height of herbaceous vegetation is 31 cm, ranging from 20 to 41 cm.

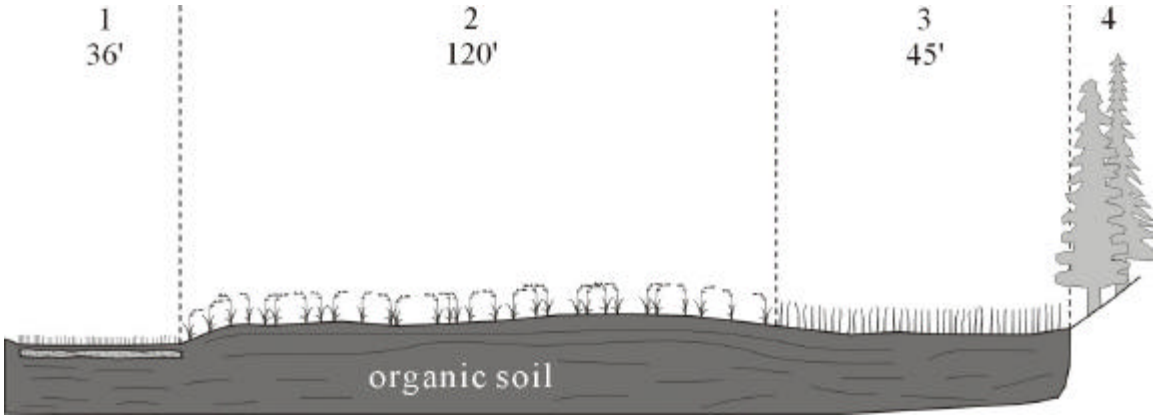
Adjacent Vegetation
Adjacent sideslope vegetation types are: subalpine fir/grouse huckleberry (*Abies lasiocarpa/Vaccinium scoparium*), lodgepole pine/pinegrass (*Pinus contorta/Calamagrostis rubescens*), lodgepole pine-subalpine fir/grouse huckleberry, grand fir/pine grass (*Abies grandis/Calamagrostis rubescens*) and other subalpine associations.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997: 172

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Woodrush sedge (*Carex luzulina*)	100	51	15-95
Few-flowered spikerush (*Eleocharis pauciflora*)	77	10	1-30
Holm's sedge (*Carex scopulorum*)	62	8	1-20
Jones' sedge (*Carex jonesii*)	54	7	1-15
Field woodrush (*Luzula campestris*)	46	7	1-15
Aquatic sedge (*Carex aquatilis*)	38	21	10-50
PERENNIAL GRASSES			
Slender muhly (*Muhlenbergia filiformis*)	77	18	2-80
Tufted hairgrass (*Deschampsia caespitosa*)	69	10	3-20
Alpine timothy (*Phleum alpinum*)	54	3	
PERENNIAL FORBS			
Alpine meadow butterweed (*Packera cymbalarioides*)	54	4	1-15
Bog St. John's wort (*Hypericum anagalloides*)	46	19	1-40
Jeffrey's shooting star (*Dodecatheon jeffreyi*)	46	9	1-35
Elephant's head (*Pedicularis groenlandica*)	46	3	1-5

Illustrations

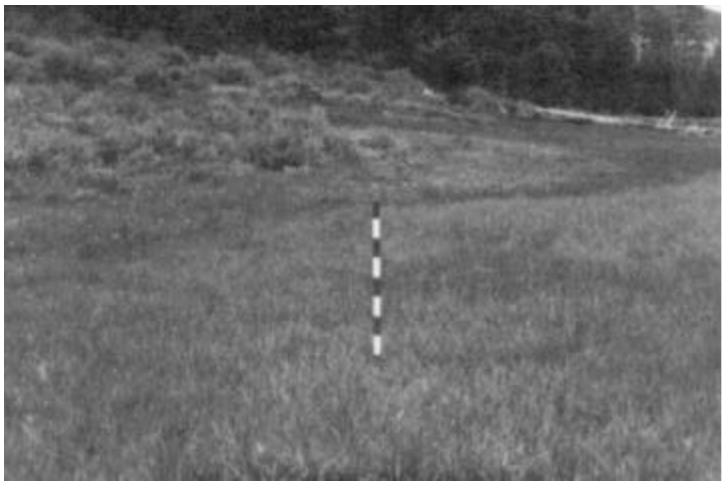
1.**Few-flowered spikerush**, wet meadow-channelway for overland flow in basin
2.**Woodrush sedge**, moist meadow
3.**Holm's sedge**, wet meadow
4.Subalpine fir-Engelmann spruce, southwest-facing toeslope



Headwater Basin of Grande Ronde River, La Grande RD, Wallowa-Whitman NF; mod. low gradient, high elevation, trough-shaped valley.

Carex nebrascensis Association

Nebraska sedge Association
30 plots. CEGL001813



Ecoregional Range
BM, BR, EC

Environment and Soils
The Carex nebrascensis association is widespread throughout central and eastern Oregon at low to moderate elevations. It occurs in moderately wide to wide, low to moderate gradient, trough- and U-shaped valleys with gentle to moderately steep side slopes. Sites are wet basins, floodplains, and springs. Where streams are present in the valley, they are C3, E6, and F6 Rosgen stream types. Stream widths are 0.5-10 m wide and woody debris in the stream channel varies from none to 50%. Soils are commonly fine-textured organic loams derived from alluvium, and they are generally deep with high water holding capacity. Two soils were less than 50 cm deep to the buried stream bed. Taxonomic soil classes are: Mollisols (Endoaquolls, Hapludolls), Andisols (Endoaquands), Entisols (Endoaquents), Inceptisols (Humaquepts), and Borohemists. The water table is near the surface or even flooding the site early in the growing season but drops to 30-50 cm (within the rooting zone) below the soil surface by mid-summer. Soils are moist through most summers.

Valley Environment	Average	Range
Elevation (ft)	4712	3770-5460
Plot Slope (%)	3	1-12
Valley Width (m)	147	65-350
Valley Gradient (%)	3	1-10
Valley Sideslopes (%)	26	15-45
Soil Characteristics		
Current Water Table Depth (cm)	23	+20-105
Rooting Depth (cm)	44	15-84
Thickness of Surface Organic Layer (cm) (where present)	31	6-65
Depth to Redoximorphic Features (cm)	44	5-23
Soil Surface Cover (%)		
Submerged	19	0-100
Bare Ground	24	0-100
Gravel	tr	0-10
Rock	1	0-20
Cryptogam	4	0-40
Litter	30	0-100

Vegetation Composition
Nebraska sedge is the dominant species in this association, commonly forming a dense sward. Baltic rush is found on most sites and is sometimes quite abundant. Other sedges and rushes are common but are very subordinant to Nebraska sedge. Other herbaceous species found in this community type are creeping spikerush, swordleaf rush (*Juncus ensifolius*) , small-winged sedge (*Carex microptera*), tall mannagrass (*Glyceria striata*), Kentucky bluegrass, yellow monkey-flower, hairy willow-herb, Northwest cinquefoil, American speedwell (*Veronica americana*), and clovers. Average height of herbaceous vegetation is 54 cm, ranging from 30 to 91 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Nebraska sedge (*Carex nebrascensis*)	100	66	30-95
Baltic rush (*Juncus balticus*)	73	12	1-95
Creeping spikerush (*Eleocharis palustris*)	30	8	1-20
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	47	3	1-15
Tufted hairgrass (*Deschampsia caespitosa*)	43	6	1-15
PERENNIAL FORBS			
Hairy willow-herb (*Epilobium ciliatum*)	33	4	1-12
Yellow monkeyflower (*Mimulus guttatus*)	30	4	1-15
Northwest cinquefoil (*Potentilla gracilis*)	30	1	1-2

Adjacent Vegetation

The Nebraska sedge Association may occur as a single association dominating a riparian area or in a complex of other meadows types, which commonly include: the Tufted hairgrass, Woolly sedge (*Carex pellita*) and Inflated sedge (*Carex vesicaria*) Associations. Adjacent upland vegetation comprises: various Grand fir (*Abies grandis*), Douglas fir (*Pseudotsuga menziesii*), Ponderosa pine (*Pinus ponderosa*), mountain big sagebrush (*Artemisia vaseyana* ssp. *vaseyana*) and western Juniper (*Juniperus occidentalis*) associations. Common Ponderosa pine associations were: Ponderosa pine/Idaho fescue , Ponderosa pine/Mountain big sagebrush/Geyer's sedge, Ponderosa pine/Common snowberry.

Successional Dynamics

The Nebraska sedge Association occurs on a variety of landforms that may once have been occupied by the bladder sedge, inflated sedge, widefruit sedge, woolly sedge, and wetter tufted hairgrass associations. Heavy livestock grazing on sites once dominated by these other herbaceous species may have eliminated or greatly reduced the previous dominants. Nebraska sedge often responds dramatically to continued season long grazing by increasing its cover.

Despite its adaptability to ungulate grazing, excessive trampling and grazing will eventually decrease Nebraska sedge cover, and Baltic rush, Kentucky bluegrass and forbs will become co-dominant. Continued overuse will result in extreme displacement of the soil surface, abundant bareground, broken and pedestalled Nebraska sedge, and soil erosion. If the water table in the valley is lowered, the site potential may change to an herbaceous association that is more adapted to a drier site.

Other Studies Documenting Association with Plot Data

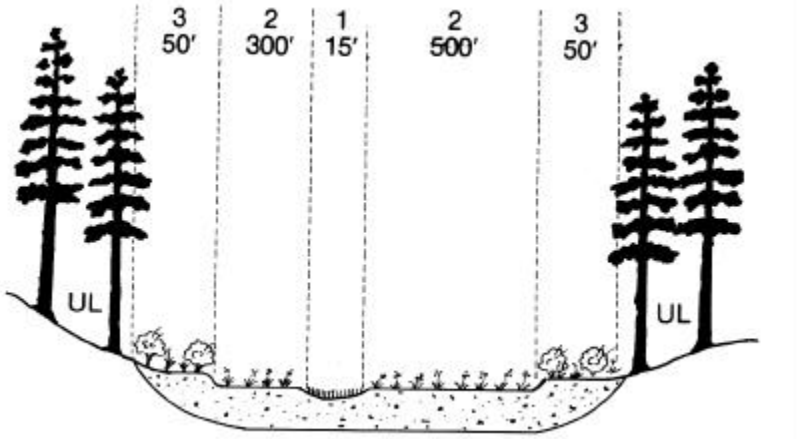
Oregon: Hall 1973:6; Christy & Cornelius 1980:plot 5; Kovalchik 1987:100; BLM E.S.I for southeastern Oregon; NRCS Basin Wet Meadow Ecological Site (023XY117OR-Harney County); NRCS Wet Meadow Ecological Site (010XY003OR-Upper Snake River Lava Plains and Hills) 1990; Crowe and Clausnitzer 1997
California: Beguin & Major 1975:353
Nevada: Manning and Padget 1992
Montana: Hansen *et al.* 1995
Idaho: Jankovsky-Jones *et al.* 2001
Colorado: Kittel *et al.* 1999
Wyoming and eastern Idaho: Youngblood *et al.* 1985
Utah and eastern Idaho: Padgett *et al.* 1989

Other Studies Documenting Association without Plot Data

Oregon: Griffiths 1902:47; Reid & Pickford 1946:91; Kierstead & Pogson 1976:1-19; Evans 1989:25.
California: Ratliff 1982:8

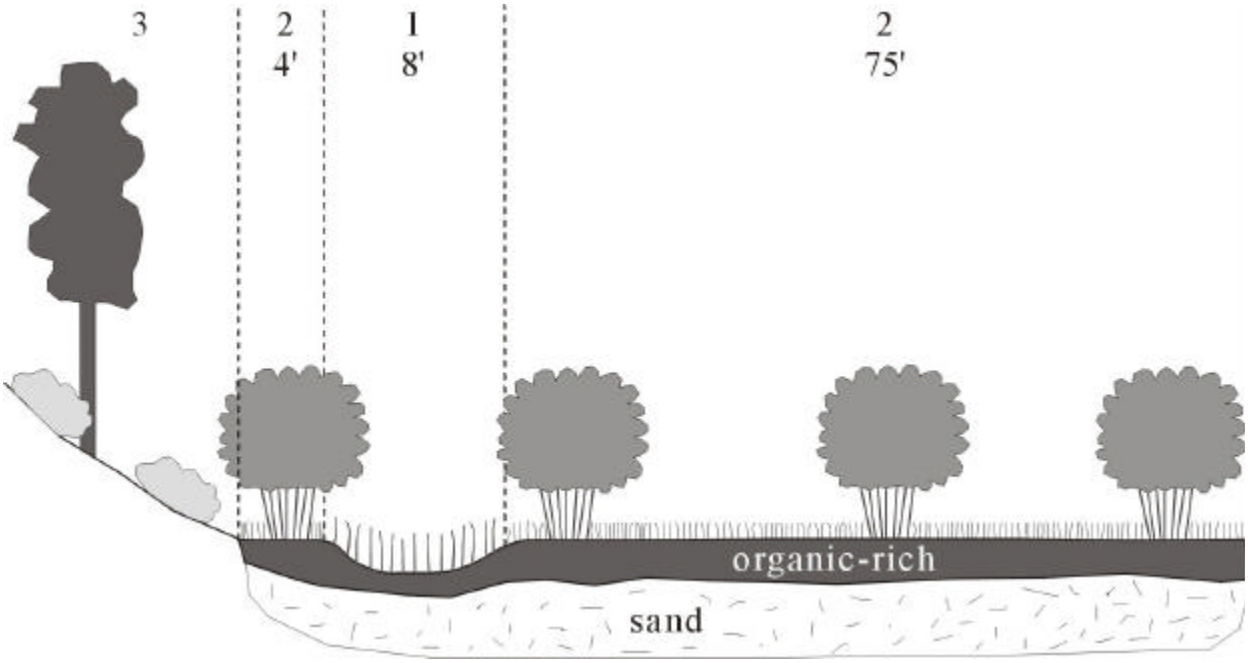
Illustrations

1.Nebraska sedge (inflated sedge potential), swale
2.Tufted hairgrass, moist meadow
3.Sagebrush/Cusick bluegrass, dry meadow



Boone Prairie; flat, mod elevation basin; Ochoco Mountains Physiographic Area.

1.**Nebraska sedge**-filled swale
2.**Willow/Kentucky bluegrass** (**Willow/woolly sedge** potential), floodplain
3.Ponderosa pine/common snowberry, northeast-facing sideslope



S. Fk. Murderer's Creek, Bear Valley RD, Malheur NF; mod. low gradient, mod. elevation, trough-shaped valley; Mesic Forest Province 1.

Carex nigricans Association

Black alpine sedge Association
24 plots.
CEGL001816

Ecoregional Range
BM, BR, EC, WC

Environment and Soils
The black alpine sedge association is locally abundant in subalpine and alpine settings in the Wallowa and Cascade Mountains. In the East Cascades, landforms are flat, poorly drained meadows, floodplains, and depressions where snowmelt is late. In the Wallowas the association commonly occurs on the driest portion of moist to wet meadows, either along the edge of the meadow adjacent to forest or on raised areas within the meadow complex. The snow free growing season is generally 2 to 3 months. Sites along streams may have slightly longer growing seasons. Soils in the East Cascades are composed of pumice alluvium on meadow and floodplain sites and pumice colluvium on snowbank sites. Soils in the Wallowa Mountains are composed of granite alluvium or collivium. Meadows sometimes have a thin layer of organic loam or sedge peat over a loamy sand subsurface horizon. Elsewhere, surface textures are loamy sand to sandy loam in pumice soils and silt loam to loam in granite soils. These surface horizons gradually mix into coarser pumice or granite below. Available water holding capacity is moderate. Water tables occur at the soil surface at snow melt and lower to 40-90 cm below the soil surface in September. Soils are cooler than those of the Holm's sedge and Black alpine sedge-Holm's sedge-tufted hairgrass Associations, which are common meadow associates of this association.

Valley Environment	Average	Range
Elevation (ft)	7128	6450-7710
Plot Slope (%)	4	0-15
Valley Width (m)	52	20-65
Valley Gradient (%)	4	1-15
Valley Sideslopes (%)	40	15-70
Soil Characteristics		
Current Water Table Depth (cm)	51	15-90
Rooting Depth (cm)	34	25-40
Temperature at 10 cm (deg F)	47	46-49
Temperature at 50 cm (deg F)	46	44-48
Soil Surface Cover (%)		
Bare Ground	6	0-35
Gravel	3	0-37
Rock	2	0-25
Bedrock	tr	0-1
Cryptogam	15	0-50
Litter	73	11-100

Vegetation Composition
On sites where black alpine sedge is very abundant, it forms a dense, tough sod, which affords little growing space for other plants. On sites where it is less abundant, herbaceous cover is shared by other herbaceous species. Average height of herbaceous vegetation is 13 cm, ranging from 10 to 15 cm.

Adjacent Vegetation
Upland associations adjacent to Black alpine sedge meadows are subalpine fir (*Abies lasiocarpa*) and mountain hemlock (*Tsuga mertensiana*) associations including subalpine fir/grouse huckleberry and subalpine fir/Labrador tea.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Red mountain-heath (*Phyllodoce empetriformis*)	54	3	1-10
SEDGES and RUSHES			
Black alpine sedge (*Carex nigricans*)	100	53	20-85
Holm's sedge (*Carex scopulorum*)	75	10	1-35
Drummond's rush (*Juncus drummondii*)	75	2	1-5
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	38	2	1-6
PERENNIAL FORBS			
Fan-leaved cinquefoil (*Potentilla flabellifolia*)	71	7	1-30
Alpine aster (*Oreostemma alpigenum* var. *alpigenum*)	54	7	1-35
Alpine meadow butterweed (*Packera cymbalarioides*)	46	8	1-25
Gray's licoriceroot (*Ligusticum grayi*)	38	3	1-10

Successional Dynamics

Moderate grazing and trampling by livestock (generally pack stock) or wild ungulate grazing, camping, or hiking seems to increase overall plant cover by increasing the cover of perennial forbs. Forbs become codominant with Black alpine sedge. Bare ground is still inconspicuous although the soil surface may be somewhat trampled and broken. With increasing impacts on the site, bare ground becomes abundant, and soil erosion may occur.

If stream channels are degraded and water tables in meadows drop, red mountain-heath (*Phyllodoce empetriformis*) and subalpine fir (*Abies lasiocarpa*) may increase on black alpine sedge sites, ultimately converting sites to forested associations.

Other Studies Documenting Association with Plot Data

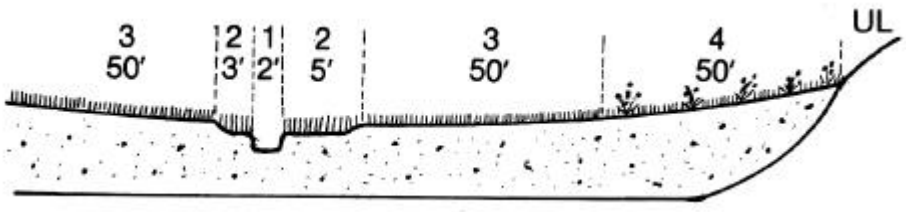
Oregon:Campbell 1973:20, 22; Cole 1977: 113; Cole 1982:20; Kovalchik 1987:128; Wooten & Morrison 1997:110; Henderson & Peter 1982:80
Washington: Kovalchik 2001

Other Studies Documenting Association without Plot Data

Oregon: Seyer 1981:7
Washington: Douglas 1972:150: Vechten 1960:66
Alaska: Viereck et al. 1992:191

Illustrations

1.Middle Fork Tumalo Creek, first order
2.**Holm's sedge**, active channel shelves and banks
3.**Black alpine sedge**, moist meadow
4.**Holm's sedge-black alpine sedge-tufted hairgrass**, moist meadow



Broken Top Meadow; low gradient, subalpine basin; Deschutes Cascades Physio-graphic Area.

Carex nudata Association*

Torrent sedge Association
3 plots. New type

Ecoregional Range
BM, CB

Valley Environment	Average	Range
Elevation (ft)	2652	1245-3830
Plot Slope (%)	2	1-3
Valley Width (m)	205	65-350
Valley Gradient (%)	2	--
Valley Sideslopes (%)	53	45-70
Soil Characteristics		
Depth to 80% Coarse Fragments (cm)	8	0-15
Soil Surface Cover (%)		
Submerged	25	1-50
Bare Ground	5	2-8
Gravel	4	0-8
Rock	20	10-30
Cryptogam	6	1-11
Litter	3	1-5

Environment and Soils
Two sites were sampled on the John Day River: one on the Middle Fork and one on the North Fork. This association is abundant along these forks of the John Day River and also along Camas Creek, which is a tributary of the North Fork. Torrent sedge plants are scattered along the lower John Day River but rarely form an entire association. One site was on the lower Deschutes River near its confluence with the Columbia Rover. Sites are bouldery stream banks and narrow alluvial bars adjacent to the banks of C-type streams.

Vegetation Composition
Torrent sedge, which grows in a distinctive cespitose form, dominates sites. Asters, field mint, spring bank clover, horsetails and hairy willow-herb are scattered at low abundance among the boulders. The sedge plants grow on top of boulders with their root masses sitting in the stream most of the growing season. Average height of herbaceous vegetation is approximately 60 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Torrent sedge (*Carex nudata*)	100	66	15-95
PERENNIAL FORBS			
Asters (*Aster* spp.)	67	10	1-18
Spring bank clover (*Trifolium wormskioldii*)	67	8	1-15
Hairy willow-herb (*Epilobium ciliatum*)	67	5	3-6
Field mint (*Mentha arvensis*)	67	5	4-5
FERNS and HORSETAILS			
Common scouring rush (*Equisetum hyemale*)	67	1	1-2
Common horsetail (*Equisetum arvense*)	67	1	--

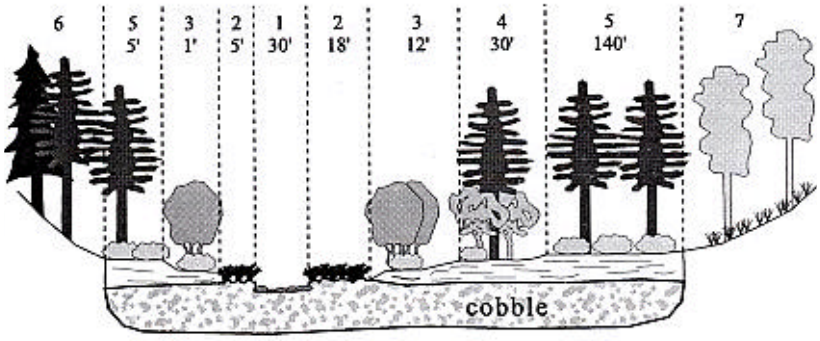
Adjacent Vegetation
Adjacent upland vegetation types are Douglas fir (*Pseudotsuga menziesii*), Ponderosa pine (*Pinus ponderosa*) and Big sagebrush (*Artemsisa* tridentata) associations including: Douglas-fir/common snowberry (*Symphoricarpos albus*), Douglas-fir/elk sedge (*Carex geyeri*), Douglas-fir/mallow ninebark (*Physocarpus malvaceus*), ponderosa pine/elk sedge (*Carex geyeri*) and Big sagebrush/Bluebunch wheatgrass (*Pseudoroegneria spicata*).

Successional Dynamics
Unless site conditions change, this association will probably not succeed to another association.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997: 212

Illustrations

1.C3/B3 stream reach
2.**Torrent sedge**, channel shelf
3.**Mountain alder/common snowberry**, floodplain
4.**Black hawthorn** (**Douglas -fir/common snowberry**-floodplain potential), inactive floodplain
5.**Douglas-fir/common snowberry-floodplain**, terrace
6.Grand fir-Douglas-fir, north-facing sideslope
7.Ponderosa pine/elk sedge, south-facing sideslope



Middle Fork John Day River, Long Creek RD, Malheur NF; very low gradient, mod. low elevation, flat-shaped valley.

Carex pellita (C. lanuginosa) Association

Woolly sedge Association
15 plots. CEGL001809

Ecoregional Range
BM, BR, EC

Environment and Soils
The Woolly sedge Association is abundant at low to moderate elevations in the central and southern Blue Mountains, the Ochoco Mountains and the Warner Mountains. Valleys are low gradient, trough-shaped (occasionally flat-shaped or V-shaped) and moderately wide with gentle to moderately steep side slopes. The Wooly sedge association occurs on floodplains and in wet headwater basins and springs. It is most common on active fluvial surfaces. Associated Rosgen stream reach types are C3, C4, E4, and E6. Stream widths are 0.5-10 m wide (most are 2-5 m wide). Soils are variable and include Mollisols (Fluvaquentic and Typic Endoaquolls), Entisols (Typic and Mollic Endoaquents) and Inceptisols (Histic Humaquept). Surface textures range from silt loam to fine sandy or sandy clay loams on floodplains and organic-rich loam in basins. Available water holding capacity is moderate to high. Floodplain soils have high water tables and are often flooded during spring runoff. On these sites the water table is well down in or below the rooting zone(within 100 cm of the surface) by mid-July. The basin sites have higher water tables and are moist through most summers.

Vegetation Composition

Woolly sedge has at least 25% cover and is the dominant graminoid on good condition sites. Kentucky bluegrass is subordinant to woolly sedge. Other graminoids are occasionally abundant, including tufted hairgrass, bluejoint reedgrass (*Calamagrostis canadensis*), small fruit bulrush (*Scirpus microcarpus*) Baltic rush (*Juncus balticus*), and weak alkaligrass (*Torreyochloa pallida* var. *pauciflora*). Forbs, including large-leaf avens, yellow monkey flower, Northwest cinquefoil, common horsetail, field mint (*Mentha arvensis*), and western polemonium (*Polemonium occidentale*) are present at low coverages. Average height of herbaceous vegetation is 62 cm, ranging from 31 to 81 cm.

Valley Environment	Average	Range
Elevation (ft)	4454	3000-5440
Plot Slope (%)	4	0-45
Valley Width (m)	138	20-350
Valley Gradient (%)	6	1-45
Valley Sideslopes (%)	25	15-45
Soil Characteristics		
Current Water Table Depth (cm)	30	0-65
Soil Surface Cover (%)		
Submerged	3	0-25
Bare Ground	21	0-85
Rock	tr	0-2
Gravel	1	0-10
Cryptogam	11	0-60
Litter	61	0-100

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Woolly sedge (*Carex pellita*)	100	44	20-70
Baltic rush (*Juncus balticus*)	53	16	1-50
Nebraska sedge (*Carex nebrascensis*)	47	9	1-20
Swordleaf rush (*Juncus ensifolius*)	47	2	1-4
Smallfruit bulrush (*Scirpus microcarpus*)	10	10	2-15
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	47	7	1-25
Common timothy (*Phleum pratense*)	40	2	1-3
Tufted hairgrass (*Deschampsia caespitosa*)	27	23	7-38
PERENNIAL FORBS			
Large-leaf avens (*Geum macrophyllum*)	53	2	0-5
Yellow monkeyflower (*Mimulus guttatus*)	33	7	1-20
Northwest cinquefoil (*Potentilla gracilis*)	33	5	1-15
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	33	10	1-40

Adjacent Vegetation

Upland vegetation adjacent to sites sampled included Ponderosa pine (*Pinus ponderosa*), Grand fir (*Abies grandis*) and Douglas fir (*Pseudotsuga menziesii*) associations.

Successional Dynamics

Sites on active channel shelves or floodplains may occasionally be seral to willow/woolly sedge as indicated by the presence of scattered willows.

With overuse by grazing animals and human activities such as camping and hiking and vehicle travel through sites, graminoids such as Nebraska sedge, small-fruit bulrush, short-beaked sedge (*Carex simulata*), Baltic rush, Kentucky bluegrass, and meadow foxtail (*Alopecurus pratensis*) increase in cover and in total are codominant with woolly sedge. If water tables are lowered on sites increases in the cover of Kentucky bluegrass and forbs such as Northwest cinquefoil, western aster (*Aster spathulatum*), western yarrow (*Achillea millefolium*), dandelion (*Taraxacum officinale*) ,and large-leaved avens are common.

With continuing overuse on moist basin land-forms, woolly sedge is replaced by graminoids such as Nebraska sedge and Baltic rush. On drier floodplain landforms, overgrazing changes the site potential towards the Kentucky bluegrass community type. On some sites streambed downcutting has lowered water tables and changed the site potential to the sagebrush/Cusick bluegrass association.

Other Studies Documenting Association with Plot Data

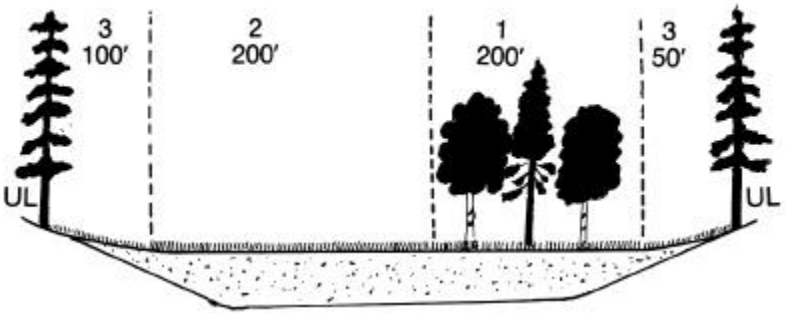
Oregon: Kovalchik 1987: 98; Evendon 1990: 48; Crowe and Clausnitzer 1997: 186
Nevada: Manning and Padgett 1995
Colorado: Kittel *et al.* 1999
Wyoming and eastern Idaho: Youngblood *et al.* 1985
Utah and eastern Idaho: Padgett *et al.* 1989

Other Studies Documenting Association without Plot Data

Oregon: Griffiths 1902: 47; Ganskopp 1979: 33; Cornelius 1981: 3
Idaho: Jankovsky-Jones *et al.* 2001

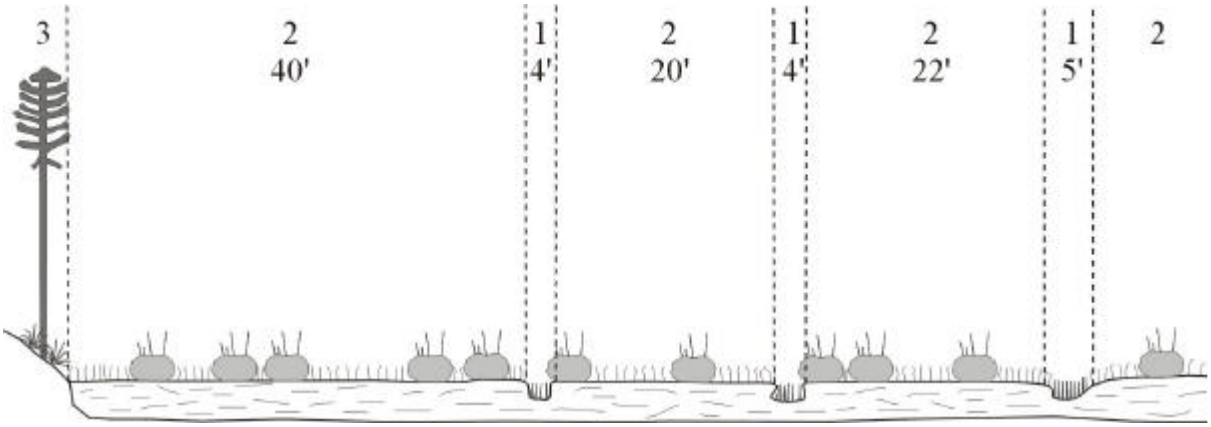
Illustrations

1. **Quaking aspen/woolly sedge**, forested wetland
2. **Woolly sedge**, moist meadow
3. Kentucky bluegrass (**ponderosa pine/common snowberry**-floodplain potential), transitional



Biggs Spring Aspen Exclosure; concave, mod elevation basin: Ochoco Mountains Physiographic Area.

1. **Woolly sedge** -filled E6 and C6 stream reach channels
2. **Silver sage/Cusick bluegrass**, floodplain
3. Lodgepole pine/pinegrass, east-facing sideslope



Beaver Meadows, Unity RD, Wallowa-Whitman NF; mod. low gradient, mod. high elevation, trough-shaped valley; Continental Zone

Carex scopulorum Association

Holm's sedge Association
30 plots. CEGL001822

Ecoregional Range
BM, BR, EC, WC

Environment and Soils
This association is very common at high elevations in the Cascade, Steens, Wallowa, Elkhorn, Strawberry and Gearhardt Mountains. It occurs in headwater basins in narrow to wide, low gradient, trough-, U- and V-shaped valleys with gentle to steep side slopes. It occurs on cold, wet, poorly-drained meadows, streambanks, and active channel shelves. The snow free growing season is 3 to 4 months. Where streams are present in the valley, they are Rosgen E5, E6 and occasionally B3 and B4 stream reach types (0.5-2m wide). Soils sampled in the Wallowa and Strawberry Mountains are Endoaquolls (Histic, Cumulic, Thapto Histic, Fluvaquentic, and Typic). Many have a histic or organic-rich epipedon with subsoil textures of loam to sandy loam. Soils can be shallow or deep to buried glacial till, colluvium or streambeds. Soils sampled in the East Cascades are shallow to moderately deep (8-40 cm) organic loam or sedge peat over buried pumice. Two plots occurred on coarse sands and gravels deposited by floodwaters and have buried organic horizons. Sites are often flooded during spring runoff, and the water table remains within 30-50 cm of the soil surface late in the growing season. Available water holding capacity is moderate to high. Soils are warmer than those of the Black alpine sedge Association.

Valley Environment	Average	Range
Elevation (ft)	7086	5600-8250
Plot Slope (%)	3	0-15
Valley Width (m)	88	5-350
Valley Gradient (%)	4	1-10
Valley Sideslopes (%)	45	15-70
Soil Characteristics		
Current Water Table Depth (cm)	20	0-52
Rooting Depth (cm)	40	25-117
Temperature at 10 cm (deg F)	51	44-62
Temperature at 50 cm (deg F)	48	44-51
Soil Surface Cover (%)		
Submerged	8	0-45
Bare Ground	9	0-70
Gravel	2	0-20
Rock	2	0-40
Cryptogam	31	95
Litter	41	99

Vegetation Composition
Holm's sedge usually forms a dense tough sod and is dominant over other herbs unless the site is disturbed by grazing animals. Black alpine sedge becomes common on the drier edge of the association. Few-flowered spikerush may be codominant with Holm's sedge on sites that are transitional to the few-flowered spikerush association. Graminoids and forbs, including fan-leaf cinquefoil, alpine meadow butterweed, alpine shooting star, Gray's licorice root, Jeffrey's shooting star, slender muhly, tufted hairgrass, and alpine timothy (*Phleum alpinum*) are scattered through the site. Dwarf willows are present in many stands in the East Cascades but show little potential to dominate the site. Average height of herbaceous layer is 29 cm, ranging from 18 to 46 cm.

Adjacent Vegetation
Upland terrace and side slope vegetation types adjacent to sites sampled in the Wallowa and Strawberry Mountains are: subalpine fir (*Abies lasiocarpa*)/grouse huckleberry (*Vaccinium scopulorum*), subalpine fir/Labrador tea (*Ledum glandulosum*) , subalpine fir-Engelmann spruce (*Picea engelmannii*) communities and other subalpine fir associations.

Other Studies Documenting Association without Plot Data
Oregon: Seyer 1981: 6; Cole 1982: 22

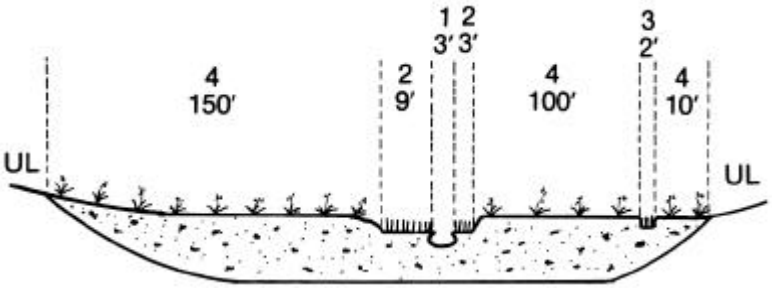
Other Studies Documenting Association with Plot Data

Oregon: Campbell 1973:36; Cole 1977:102; Kovalchik 1987:132; Manning & Padgett 1989:56; Evenden 1990:44; Manning & Padgett 1991:387; Crowe and Clausnitzer 1997: 170
Washington: Kovalchik 2001
Montana: Hansen *et al.* 1995
Nevada: Manning and Padgett 1995
Colorado: Kittel *et al.* 1999

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Holm's sedge (*Carex scopulorum*)	100	68	25-95
Few-flowered spikerush (*Eleocharis quinqueflora*)	50	24	1-75
Black alpine sedge (*Carex nigricans*)	47	9	1-25
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	53	5	1-10
Slender muhly (*Muhlenbergia filiformis*)	27	13	1-70
PERENNIAL FORBS			
Fan-leaved cinquefoil (*Potentilla flabellifolia*)	57	8	1-35
Alpine meadow butterweed (*Packera cymbalarioides*)	47	8	1-25
Alpine shooting star (*Dodecatheon alpinum*)	33	10	1-40
Gray's licoriceroot (*Ligusticum grayi*)	30	3	1-10
Jeffrey's shooting star (*Dodecatheon jeffreyi*)	30	2	tr-10

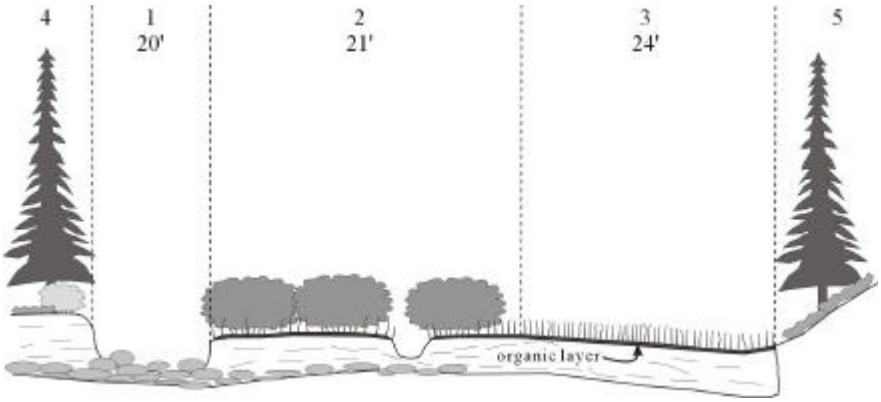
Illustrations

1.Todd Creek, first-order
2.**Holm's sedge**, active channel shelves and streambanks
3.**Holm's sedge**, overflow channel
4.**Tufted hairgrass**, dry meadow



Water Tower Meadow; low gradient,subalpine basin; Deschutes Cascades Physiographic Area.

1.B3 stream reach
2.**Undergreen willow/Holm's sedge**, floodplain
3.**Holms sedge**, overflow swale
4.**Subalpine fir/Labrador tea**, terrace
5.Subalpine fir/grouse huckberry, northeast-facing sideslope



East Lostine River, Eagle Cap RD, Wallowa-Whitman NF; mod. gradient, high elevation, U-shaped valley.

Carex scopulorum-Carex nigricans-Deschampsia caespitosa Association

Holm's sedge-black alpine sedge-tufted hairgrass Association
22 plots. New type

Ecoregional Range
BM, BR, EC

Environment and Soils
This association is very common at high elevations in the Cascade, Steens, Wallowa, Elkhorn, Strawberry and Gearhardt Mountains. Landforms are low to moderate gradient, moist meadows, streambanks, floodplains and headwater basins. The sites on which this association occurs are intermediate in soil moisture between tufted hairgrass and Black alpine sedge or Holm's sedge associations.

Soils are variable. About half of the plots had organic loam or sedge peat surface horizons 20-50 cm thick over alluvium subsoils. In some horizons buried organic soils were intermixed with layers of pumice, granite or other parent materials. Organic surfaces may indicate the site was once dominated by wetter associations. Other sites were drier and surface textures were coarse sandy to fine sandy loams. Available water holding capacity is moderate to high. Soils are saturated at snowmelt and the water table lowers to 20-80 cm below the soil surface in September. Soils are warmer than those of both the Black alpine sedge and the Holm's sedge Associations.

Valley Environment	Average	Range
Elevation (ft)	6574	4700-7880
Plot Slope (%)	2	1-5
Valley Width (m)	99	65-200
Valley Gradient (%)	2	1-5
Valley Sideslopes (%)	29	15-70
Soil Characteristics		
Current Water Table Depth (cm)	46	16-80
Rooting Depth (cm)	44	24-71
Temperature at 10 cm (deg F)	53	52-53
Temperature at 50 cm (deg F)	51	50-52
Soil Surface Cover (%)		
Submerged	2	0-10
Bare Ground	9	0-75
Gravel	tr	0-5
Rock	tr	0-2
Cryptogam	19	0-70
Litter	60	1-97

Vegetation Composition
This association is characterized by co-dominance of graminoids and forbs. Tufted hairgrass, along with Holm's sedge and/or black alpine sedge are the dominant graminoids. Other graminoids include timber oatgrass, few-flowered spikerush (*Eleocharis quinqueflora*), and slender muhly. Forbs include alpine pussytoes, gray licorice root, alpine aster, fanleaf cinquefoil, few-leaved groundsel, and long stalk clover. Moss cover can be very high. Average height of herbaceous vegetation is 17 cm, ranging from 13 to 20 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Holm's sedge (*Carex scopulorum*)	82	24	1-60
Black alpine sedge (*Carex nigricans*)	55	21	5-60
Few-flowered spikerush (*Eleocharis quinqueflora*)	41	10	2-20
Woodrush sedge (*Carex luzulina*)	36	1	1-3
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	100	21	3-70
Slender muhly (*Muhlenbergia filiformis*)	45	10	1-25
Timber oatgrass (*Danthonia intermedia*)	36	10	1-35
PERENNIAL FORBS			
Fan-leaved cinquefoil (*Potentilla flabellifolia*)	34	16	1-70
Alpine meadow butterweed (*Packera cymbalarioides*)	59	6	1-20
Alpine aster (*Oreostemma alpigenum* var. *alpigenum*)	55	11	1-40
Longstalk clover (*Trifolium longipes*)	45	13	1-55

Adjacent Vegetation

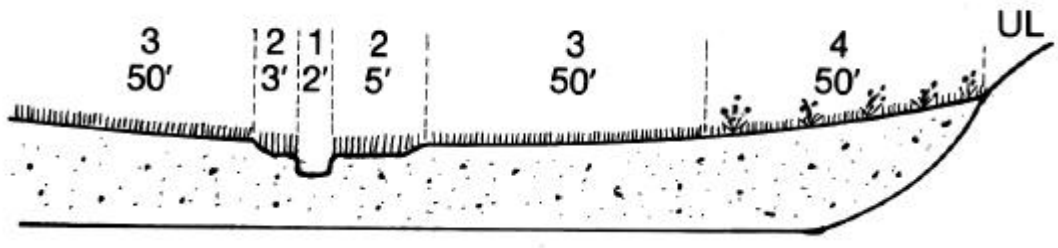
Upland terrace and side slope vegetation types adjacent to sites sampled in the Wallowa and Strawberry Mountains are: subalpine fir (*Abies lasiocarpa*)/grouse huckleberry (*Vaccinium scopulorum*), subalpine fir/Labrador tea (*Ledum glandulosum*), subalpine fir-Engelmann spruce (*Picea engelmannii*) communities and other subalpine fir associations.

Successional Dynamics

Overuse by grazing animals and through human activities such as camping and hiking and vehicle travel through sites increases forbs and bareground cover at the expense of tufted hairgrass, Holm's sedge, and black alpine sedge. Grasses such as timber oatgrass or slender muhly gain more cover than tufted hairgrass. Continued overuse, especially on wet soils, decreases total herbaceous cover and increases the amount of bare ground. The ecological status of Holm's sedge-black alpine sedge-tufted hairgrass is speculative. Given the large cover of forbs, these stands may be degraded Holm's sedge or Black alpine sedge associations. Sites with Holm's sedge as the dominant sedge and with moderately thick, wet, organic surface soils may have Holm's sedge potential. Drier sites, especially those with mineral soils, may have Black alpine sedge potential.

Illustrations

1.Middle Fork Tumalo Creek, first order
2.**Holm's sedge**, active channel shelves and streambanks
3.**Black alpine sedge**, moist meadow
4.**Holm's sedge-black alpine sedge-tufted hairgrass**, moist meadow



Broken Top Meadow; low gradient, subalpine basin; Deschutes Cascades Physiographic Area.

Carex sheldonii Association*

Sheldon's sedge Association
3 plots. New type

Valley Environment	Average	Range
Elevation (ft)	4587	4000-5040
Plot Slope (%)	2	1-4
Valley Width (m)	50	20-54
Valley Sideslopes (%)	25	15-45
Soil Characteristics		
Current Water Table Depth (cm)	62	45-79
Rooting Depth (cm)	19	18-20
Soil Surface Cover (%)		
Bare Ground	4	0-10
Cryptogam	tr	0-1
Litter	68	3-100

Ecoregional Range
BM, EC

Environment and Soils
Although only three sites were sampled (Prairie City RD and Burns Rds, Malheur NF; North Fork John Day RD, Umatilla NF), this association occurs sporadically through the southern Blue Mountains. It appears to grow on floodplains or in small patches on terraces where there is a groundwater source. The valleys in which plots was located were moderately wide, very low gradient and flat-or trough-shaped. Soils are mineral with silt loam surface horizons. The water table fluctuates from the surface in late spring to about 50 cm deep by mid-summer.

Vegetation Composition
Sheldon's sedge dominates the site. Other species present include western polemonium, common cowparsnip, and sweet-scented bedstraw. Average height of herbaceous vegetation is 58 cm, ranging from 36 to 81 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Big sagebrush (*Artemisia tridentata*)	33	10	--
SEDGES and RUSHES			
Sheldon's sedge (*Carex sheldonii*)	100	86	65-98
Baltic rush (*Juncus balticus*)	67	8	1-15
Small-winged sedge (*Carex microptera*)	67	6	2-10
Nevada sedge (*Juncus nevadensis*)	33	10	--
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	33	25	--
PERENNIAL FORBS			
Western yarrow (*Achillea millefolium*)	67	2	1-3
Western polemonium (*Polemonium occidentale*)	33	25	--
Common cowparsnip (*Heracleum maximum*)	33	10	--
Sweet-scented bedstraw (*Galium triflorum*)	33	10	--

Adjacent Vegetation
Adjacent sideslope vegetation types are: ponderosa pine/mountain big sagebrush/Idaho fescue-bluebunch wheatgrass (*Pinus ponderosa/Artemisia tridentata* spp. *vaseyana/Festuca idahoensis-Pseudoroegneria spicata*), ponderosa pine/Geyer's sedge, grand fir/pinegrass (*Abies grandis/Calamagrostis rubescens*), mountain big sagebrush/Idaho fescue-bluebunch wheatgrass (*Artemisia tridentata* spp. *vaseyana/Festuca idahoensis-Pseudoroegneria spicata*) and lodgepole pine (*Pinus contorta*) communities.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997: 201
Idaho: Moseley 1998: 46; Jankovsky-Jones *et al.* 2001

Other Studies Documenting Association without Plot Data
Oregon: Seyer 1981: 17; Titus and Christy 1996a, 1999

Carex simulata Association

Short-beak sedge Association
25 plots. CEGL001825

Ecoregional Range
BM, CR, EC, WC

Environment and Soils
The short-beaked sedge association is scattered throughout central and Oregon from the East Cascades Ecoregion to the southern Blue Mountains. Many landforms are on flat to gently sloping, fen-like meadows with a layer of cold, mucky, groundwater below the soil surface. Thus, the soils often quake when walked on. This association can also occur on mineral soils in meadows. Sites, however, are still very wet. Most soils are organic loam and sedge peat. Available water holding capacity is high and soils remain saturated through the summer in most years. The site is shallowly flooded with a few inches of water in June and July and the water table is within 18 inches of the soil surface in September.

Valley Environment	Average	Range
Elevation (ft)	4624	3770-5990
Plot Slope (%)	1	0-3
Valley Width (m)	273	20-350
Valley Gradient (%)	2	1-3
Valley Sideslopes (%)	24	15-70
Soil Characteristics		
Current Water Table Depth (cm)	25	0-57
Thickness of Surface Organic Layer (cm)	50	20-80
Soil Surface Cover (%)		
Submerged	23	0-100
Bare Ground	12	0-80
Gravel	tr	0-1
Rock	1	0-13
Cryptogam	25	0-98
Litter	43	0-95

Vegetation Composition:
Short-beakedsedge is the dominant graminoid. Other sedges such as aquatic sedge (*Carex aquatilis*), widefruit sedge (*Carex angustata*), bladder sedge, Nebraska sedge and Sitka sedge (*Carex sitchensis*) are scattered and stunted. Few-flowered spikerush (*Eleocharis quinqueflora*) and Baltic rush are often present but are low in cover. Mosses are abundant except on more permanently flooded sites. Forbs are usually weakly represented. Dwarfed willows and bog birch are often present but are inconspicuous and restricted to dry microsites. The vegetative composition suggests a close relationship to the few-flowered spikerush association. Average height of herbaceous vegetation is approximately 40 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Shortbeak sedge (*Carex simulata*)	100	53	22-80
Baltic rush (*Juncus balticus*)	52	9	1-20
Nebraska sedge (*Carex nebrascensis*)	40	15	1-35
Bladder sedge (*Carex utriculata*)	40	15	2-38
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	60	6	0-20
PERENNIAL FORBS			
Yellow monkeyflower (*Mimulus guttatus*)	44	1	1-3
Hairy willow-herb (*Epilobium ciliatum*)	36	1	1-3
Bog saxifrage (*Saxifraga oregana*)	28	3	1-8

Adjacent Vegetation

Upland vegetation adjacent to sites sampled included white fir, black cottonwood and Ponderosa pine associations as well as Grand fir/grouse huckleberry and big sagebrush/Bluebunch wheatgrass.

Other Studies Documenting Association with Plot Data

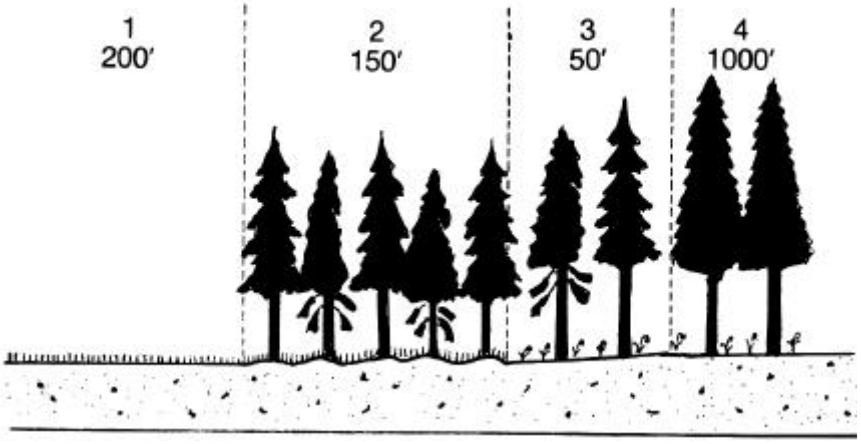
Oregon: Christy & Cornelius 1980:plot 35; Kovalchik 1987:106; Crowe and Clausnitzer 1997: 200; Titus and Christy 1996, 1999
Nevada: Manning and Padgett 1995
Montana: Hansen *et al.* 1995
Idaho: Jankovsky-Jones *et al.* 2001
Colorado: Kittel *et al.* 1999
Wyoming and eastern Idaho: Younglblood *et al.* 1985
Utah and eastern Idaho: Padgett *et al.* 1989

Other Studies Documenting Association without Plot Data

Oregon: Evans 1989: 35

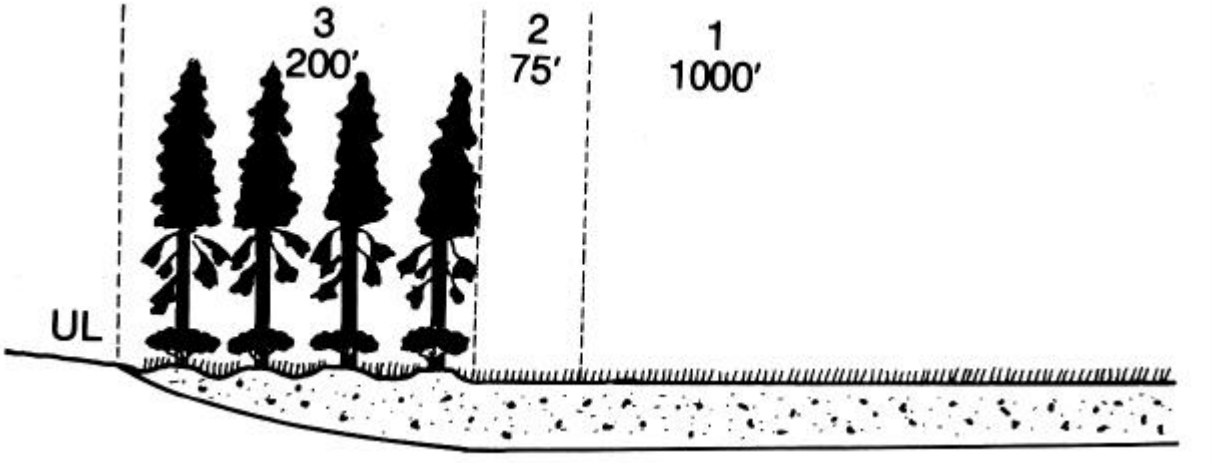
Illustrations

1. Short-beaked sedge, wet meadow
2. Engelmann spruce/widefruit sedge, forested wetland
3. Engelmann spruce/queencup beadlily, transitional
4. White fir/queencup beadlily, terrace



Squaw Creek Marsh; low gradient, mod elevation basin; Deshutes Cascades Physiographic Area.

1. Slender sedge, wet meadow
2. Short-beaked sedge, wet meadow
3. Lodgepole pine/bog blueberry/widefruit sedge, forested wetland



Stimson Meadow; flat, mod-high elevation basin; Pumice-mantled Basin and Range Physiographic Area; Winema National Forest.

Carex spectabilis-Lupinus arcticus ssp. *subalpinus* Association*

Showy sedge-subalpine artic lupine Association
2 plots. CEGL001973

Ecoregional Range
BM?, EC

Environment and Soils
This association was sampled twice in the East Cascades at high elevations (6560-6640 ft.) on low to moderately steep (0-5%) meadow sites.

Vegetation Composition
Showy sedge and broadleaf lupine are co-dominant on sites. Species richness is low.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Showy sedge (*Carex spectabilis*)	100	51	41-60
Black alpine sedge (*Carex nigricans*)	100	2	--
Holm's sedge (*Carex scopulorum*)	50	10	0-20
PERENNIAL FORBS			
Subalpine lupine (*Lupinus arcticus* ssp. *subalpinus*)	100	33	32-33
Alpine lake prairie dandelion (*Nothocalais alpestris*)	100	2	1-2
Newberry's polygonum (*Polygonum davisiae*)	100	2	1-2
Gray's licoriceroot (*Ligusticum grayi*)	100	1	--

Other Studies Documenting Association with Plot Data
Washington: Kovalchik's (2001) *Carex spectabilis* Association is similar to this one.

Carex stipata Association*

Sawbeak sedge Association
3 plots. New type

Ecoregional Range
BM

Environment and Soils
Three sites were sampled at moderate elevations (366--4730 ft.): one on the North Fork John Day Ranger District (Umatilla NF); one in Big Marsh on the Deschutes National Forests; and one in Hells Canyon. Both sites were in wide (65-200 m), trough-shaped, wet basins with low gradients and gentle side slopes. Standing water covered 15-50% of the plots, and moss cover was high on one site.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Sawbeak sedge (*Carex stipata*)	100	50	40-60
Smallfruit bulrush (*Scirpus microcarpus*)	67	67	10-30
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	67	43	6-80
Tufted hairgrass (*Deschampsia caespitosa*)	67	13	5-20
Creeping bentgrass (*Agrostis stolonifera*)	67	1	1-2
Kentucky bluegrass (*Poa pratensis*)	67	1	--
PERENNIAL FORBS			
Hairy willow-herb (*Epilobium ciliatum*)	100	4	tr-9
Asters (*Aster* spp.)	67	5	tr-5

Vegetation Composition
Saw-beak sedge cover was high with abundant small-fruit bulrush and, on one site, tall mannagrass. Other herbaceous species were present at low cover. Average height of herbaceous vegetation is approximately 60 cm.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997

Carex utriculata Association

Bladder sedge Association
56 plots. CEGL001562

Ecoregional Range
BM, BR, EC, WC

Environment and Soils

Beaked sedge is one of the wettest riparian associations. Because of its wide geographic and elevational distribution, the association occurs on a wide variety of physiographic areas and riparian landforms. Low gradient landforms supporting beaked sedge range from permanently flooded basins to floodplains and wet meadows. Beaked sedge occurs on wet fluvial surfaces such as streambanks, active channel shelves, overflow channels, marshes, and fens. Where streams are present in the valley, they are C3, C4, E3, E4, E6, and F6 Rosgen types. Stream widths are 0.5-25 m wide (most are 1.5-5 m wide).

Soils are deep sedge or sedimentary peats, organic loam, or muck except for recently deposited alluvium on sites such as active channel shelves. Soil taxonomic classifications included Saprists, Hemists, Endoaquolls or Endoaqepts, and Fluvaquents. The organic layers are often quite deep (50-100 cm or more) indicating mature, anaerobic, soils. Available water holding capacity is moderate to high. Wet sites such as lake shores and flooded basins have water tables ranging from 20-90 cm above the soil surface in June and July and 12 to 65 cm above the soil surface in September. Drier sites such as meadows have water tables 0 to 50 cm above the soil surface in June and July, lowering to 30 to 40 cm below the soil surface in September. Soils remain moist to saturated throughout the growing season except in driest years.

Valley Environment	Average	Range
Elevation (ft)	5027	3860-7470
Plot Slope (%)	2	0-10
Valley Width (m)	203	20-350
Valley Gradient (%)	2	1-10
Valley Sideslopes (%)	37	15-70
Soil Characteristics		
Current Water Table Depth (cm)	0	+30-41
Thickness of Surface Organic Layer (cm)	42	3-84
Rooting Depth (cm)	52	18-127
Soil Surface Cover (%)		
Submerged	29	0-100
Bare Ground	30	0-100
Gravel	tr	0-20
Rock	tr	0-2
Litter	30	0-100

Vegetation Composition

Bladder sedge is the dominant graminoid. It forms a dense herbaceous overstory, generally excluding abundant coverage by any other herbaceous species. However, Sitka sedge (*Carex aquatilis* var. *dives*), aquatic sedge (*Carex aquatilis*), and widefruit sedge (*Carex angustata*) are common where the bladder sedge association is ecotonal to associations dominated by these species. Shrubs and grasses are scattered. Grasses on drier sites include tall mannagrass (*Glyceria striata*) fowl bluegrass (*Poa palustis*), slender muhly *Muhlenbergia filiformis*), and tufted hairgrass. Northern mannagrass (*Glyceria borealis*) is the only common grass on the more permanently flooded portions of the association. Forbs on drier sites include yellow monkeyflower (*Mimulus guttatus*), westerndock (*Rumex occidentalis*), bog saxifrage (*Saxifraga oregana*), willow-herbs, and large-leaved avens (*Geum macrophyllum*). Wet sites support aquatic forbs such as bog buckbean (*Menyanthes trifoliata*), pondlily (*Nuphar* spp.), burreed (*Sparganium* spp.), pondweed (*Potamogeton* spp.), bladderwort (*Utricularia* spp.), and water lentil (*Lemna minor*). Their cover is variable, ranging from nearly absent in early summer to abundant in late summer.

The bladder sedge association has considerable variation in its forb component in wet versus dry climatic cycles. In wet years it may be flooded nearly summer long and aquatic forbs become common. In drought years flooding is brief and the aquatic component will be present only during high water or absent.

Average height of herbaceous vegetation is 60 cm, ranging from 30 to 90 cm.

Adjacent Vegetation

Upland vegetation types adjacent to the Bladder sedge Association are quite varied due to the wide amplitude of environments in which this association occurs. They include Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Ponderosa pine (*Pinus ponderosa*), Grand fir (*Abies grandis*), white fir (*Abies concolor*) and subalpine fir (*Abies lasiocarpa*) associations.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Bladder sedge (*Carex utriculata*)	100	67	20-100
Baltic rush (*Juncus balticus*)	34	6	tr-45
Smallfruit bulrush (*Scirpus microcarpus*)	23	10	1-40
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	21	12	1-70
Kentucky bluegrass (*Poa pratensis*)	21	5	1-20
Bluejoint reedgrass (*Calamagrostis canadensis*)	14	6	1-30
PERENNIAL FORBS			
American speedwell (*Veronica americana*)	23	3	1-10
Western polemonium (*Polemonium occidentale*)	21	3	1-10
Hairy willow-herb (*Epilobium ciliatum*)	21	3	1-15

Specific associations in the Blue Mountains included: terraces - ponderosa pine/common snowberry (*Symphoricarpos albus*) , shrubby cinquefoil (*Dasiphora floribunda*)/Kentucky bluegrass, lodgepole pine (*Pinus contorta*) communities, sagebrush/Cusick's bluegrass (*Poa cusickii*);
sideslopes - grand fir/big huckleberry (*Vaccinum membranaceum*), grand fir/grouse huckleberry (*Vaccinium scopulorum*)-twinflower (*Linnaea borealis*), ponderosa pine/big sagebrush/elk sedge (*Carex geyeri*), ponderosa pine/common snowberry and lodgepole pine communities.

Successional Dynamics

Presence of scattered willows may indicate a willow/sedge association potential on the site. A site on which bladder sedge has formed an extremely dense network of rhizomes, however, may exclude the establishment of willows, especially if the site experiences no seasonal flooding or flooding that does not deposit fresh mineral substrate. Also, sites that are subjected to prolonged flooding or season-ong saturation may exclude willow establishment because some willow species cannot tolerate prolonged submersion of their root crowns (Esser 1992, Tesky 1992).

With overuse by livestock on drier sites, graminoids such as tall mannagrass, meadow barley, tufted hairgrass, small-fruit bulrush, slender muhly, Nebraska sedge, and short-beaked sedge (*Carex simulata*) increase in cover and become codominant with bladder sedge. The soil surface is somewhat broken and trampled. With continued overuse, the beaked sedge association is altered to Nebraska sedge or the site is lost to streambank erosion or streambed downcutting. Semi-permanently to permanently flooded sites have not been observed in less than late seral ecological status.

Other Studies Documenting Association with Plot Data

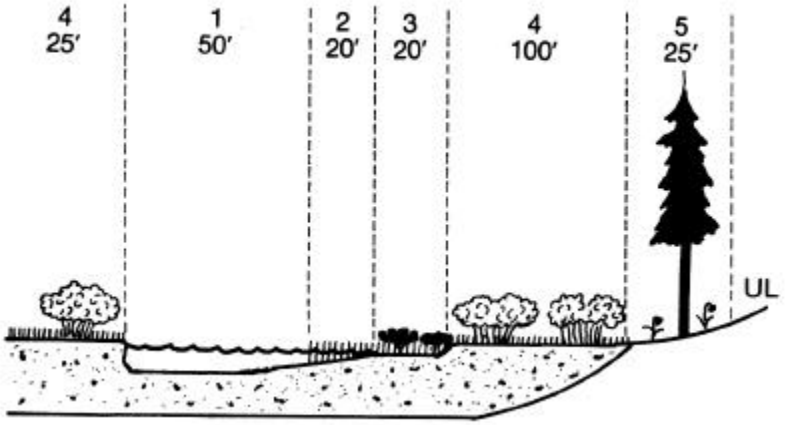
Oregon: Seyer 1979:35; Kauffman 1982:59; Kauffman et al. 1985:16; Frenkel et al. 1986:33; Halpern 1986:11; Johnson & Simon 1987:225; Kovalchik 1987: 118; Titus 1996; Titus & Christy 1996a, 1999; Murray 2000; Crowe and Clausnitzer 1997
Washington: Kunze 1994:26, 63; Kovalchik 2001
Idaho: Moseley 1998:29
Montana: Hansen *et al.* 1995
Alaska: Boggs 2000
Nevada: Manning and Padgett 1995
Colorado: Kittel *et al.* 1999
Wyoming and eastern Idaho: Youngblood *et al.* 1985
Utah and eastern Idaho: Padgett *et al.* 1989

Other Studies Documenting Association without Plot Data

Oregon:Stuth 1975:71; Cole 1977:102; Seyer 1981:10; Cole 1982:22; Ratliff 1982:5; Alaska: Viereck et al. 1992:183
Idaho: Jankovsky-Jones *et al.* 2001

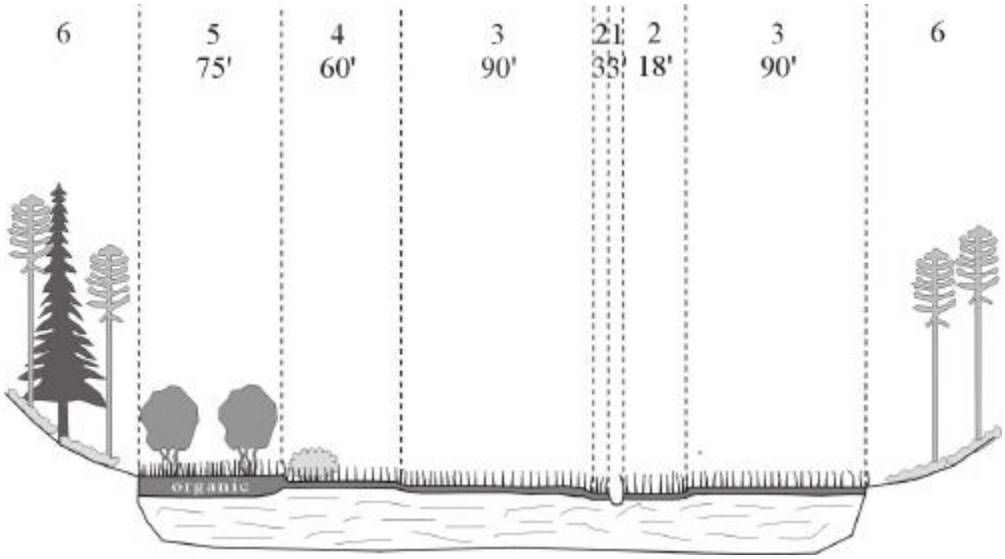
Illustrations

1.Beaver pond (Link Creek)
2.Bladder sedge, permanently flooded shore
3.Bob blueberry/Sitka sedge, active channel shelf
4.Willow/Sitka sedge, wet shrub meadow
5.Engelmann spruce/queencup beadlily, transition slope



Santiam Pass Marsh; flat, mod-high elevation basin; Deschutes Cascades Physiographic Area.

1.E5 stream reach
2.**Aquatic sedge**, wet meadow-floodplain
3.**Bladder sedge**, wet meadow-floodplain
4.**Undergreen willow/bladder sedge**, wet meadow
5.**Mountain alder/bladder sedge**, wet meadow
6.Lodgepole pine (subalpine fir)/grouse huckleberry, northwest- and southeast-facing sideslopes



Lake Creek, North Fork John Day RD, Umatilla NF; very low gradient, mod. high elevation, flat-shaped valley.

Carex vesicaria Association

Eastside inflated sedge Association
24 plots. CEGL002661.

Ecoregional Range
BM, BR, CR, EC

Environment and Soils
Because of its wide geographic and elevational distribution, the inflated sedge association occurs in a wide variety of low gradient landforms supporting shallow flooding or semi-permanently saturated soils. Landforms range from flooded basins to floodplains, lakeshores, and wet meadows. It is found at moderate to somewhat high elevations in moderately wide, very low gradient U- and trough-shaped valleys with gentle side slopes. In the Cascade Mountains, this association occurs on slightly drier sites and extends to higher elevations. In other areas of central and eastern Oregon the inflated and bladder sedge assocations appear to occupy similar sites and in eastern Oregon, bladder sedge occurs at higher elevations than inflated sedge.

Soils are deep sedge and sedimentary peats or organic loam except on seral sites such as active channel shelves. Deep organic soils indicate mature, long lived, anaerobic sites. Mineral soils range from coarse sandy loam to silty clay loam. Available water holding capacity is moderate to high. Wetter sites such as semi-permanently flooded shores are flooded through the summer except in drought years. Here, maximum water depths ranged from 25-75 cm above the soil surface in June and July and near to slightly above the soil surface in September. Water depths on drier sites ranged from 0 to 50 cm above the surface in June and July and lowered to 30 to 60 cm below the soil surface in September. Soils are moist to saturated throughout the growing season.

Valley Environment	Average	Range
Elevation (ft)	4968	3060-6340
Plot Slope (%)	4	0-50
Valley Width (m)	65	--
Valley Gradient (%)	7	1-50
Valley Sideslopes (%)	15	--
Soil Characteristics		
Thickness of Surface Organic Layer (cm)	42	5-75
Current Water Table Depth (cm)	42	+40-114
Soil Surface Cover (%)		
Submerged	36	0-100
Bare Ground	28	0-98
Gravel	1	0-25
Rock	tr	0-1
Cryptogam	13	0-70
Litter	23	0-100

Vegetation Composition
Inflated sedge forms a dense canopy with abundant litter beneath. Grasses, especially northern mannagrass (*Glyceria borealis*) and reed canarygrass (a noxious weed), are more abundant here than in the bladder sedge association. Nebraska sedge (*Carex nebrascensis*) also increases on grazin--disturbed sites. Grasses such as tufted hairgrass and fowl bluegrass (*Poa palustris*) occur on drier sites. Forbs such as western dock, and small bedstraw (*Galium trifidum*) are low in cover except on disturbed portions of drier sites. Aquatic forbs such as pondweed (*Potamogeton* spp.) and bladderwort can have up to 63 percent canopy cover on flooded sites.

Poorly drained basins may have considerable variation in their forb component in wet vs. dry years. In wet years they may be flooded year round and aquatic forbs are common. In dry years aquatic forbs will be present only during high water, if at all. Average height of herbaceous vegetation is approximately 45 cm.

Adjacent Vegetation
This type is often adjacent to other valley bottom wet graminoid types, including Nebraska sedge, tufted hairgrass, or wet shrubs including swamp laurel, bog blueberry, Douglas' spiraea.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Inflated sedge (*Carex vesicaria*)	100	60	30-100
Baltic rush (*Juncus balticus*)	38	5	1-15
Creeping spikerush (*Eleocharis palustris*)	33	11	1-30
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	54	3	1-10
PERENNIAL FORBS			
Hairy willow-herb (*Epilobium ciliatum*)	25	5	1-15
Common bladderwort (*Utricularia vulgaris*)	17	5	1-10
Western dock (*Rumex occidentalis*)	17	2	1-5

Successional Dynamics

Inflated sedge stands are unlikely to be seral to willow/sedge associations. With overuse by ungulates on driersites, graminoids such as Baltic rush, Nebraska sedge, tufted hairgrass, and slender muhly increase in cover and become codominant with inflated sedge. Forbs such as small bedstraw, meadow arnica (*Arnica chamissonis*), western dock, field mint (*Mentha arvensis*), and silverweed (*Argentina anserina*) become common. The soil surface is broken and trampled. With continued overuse, grazing, trampling, and erosion changes the association to Nebraska sedge or the site is lost to erosion. Wetter sites in less than late seral ecological status.

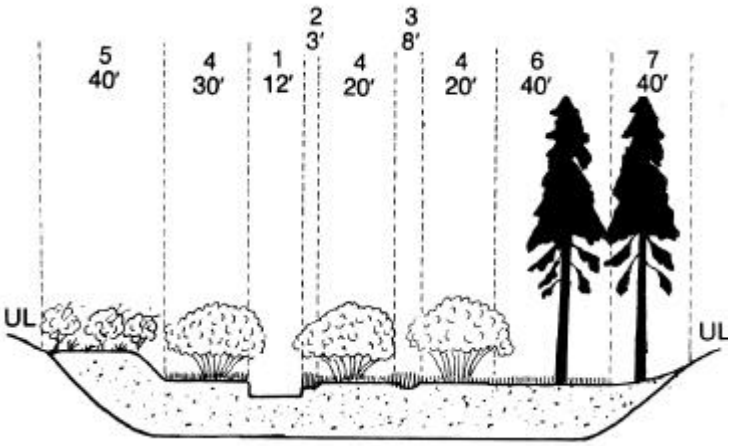
Other Studies Documenting Association with Plot Data

Oregon: Christy & Cornelius 1980: plot 48; Henderson & McAllister 1983:2; Kovalchik 1987:116; Crowe and Clausnitzer 1997
Washington: Kovalchik 2001
Nevada: Manning and Padgett 1995
Colorado: Kittel *et al.* 1999
Wyoming and eastern Idaho: Youngblood *et al.* 1985

Other Studies Documenting Association without Plot Data

Oregon: Titus & Christy 1996a, 1999

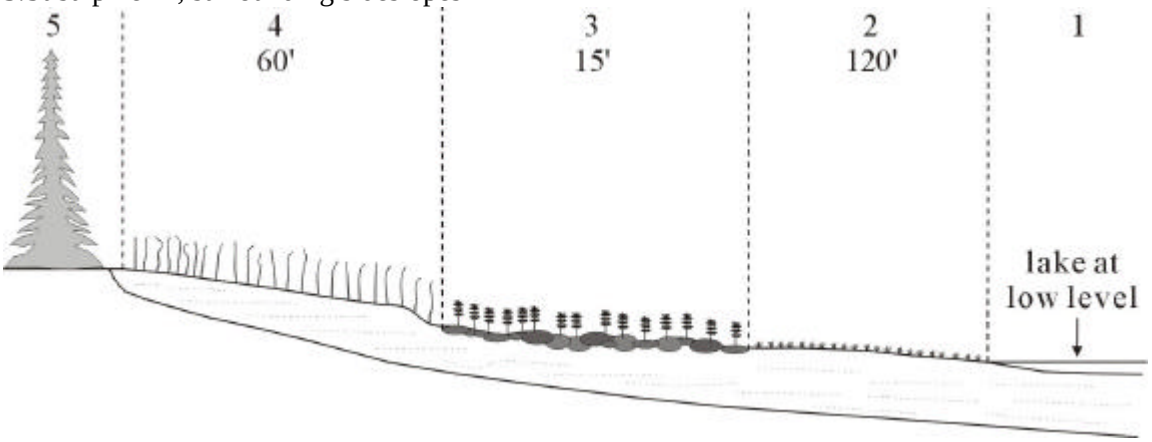
Illustrations



1.Fivemile Creek, second order
2.**Inflated sedge**, streambanks
3.**Inflated sedge**, overflow channel
4.Willow/Kentucky bluegrass and Kentucky bluegrass (**Booth-Geyer willow/ widefruit sedge** potential), inactive floodplains
5.**Mountain big sagebrush/Cusick bluegrass**, terraces
6.Lodgepole pine/Kentucky bluegrass (invasion into Kentucky bluegrass), inactive floodplain
7.**Lodgepole pine/bearberry**, transitional

Fivemile Creek; low gradient, low elevation floodplain; Pumice-mantled Basin and Range Physiographic Area; Fremont NationalForest, East Cascades Ecoregion.

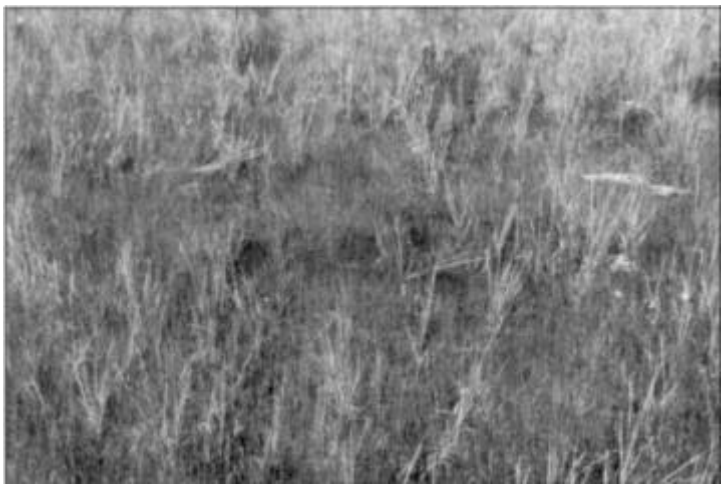
1.Strawberry Lake
2.**Delicate spikerush**, exposed lakebed
3.**Common horsetail**, alluvial fan where tributary stream enters lake basin
4.**Inflated sedge**, edge of lake at highwater level
5.Subalpine fir, surrounding sideslopes



Strawberry Lake, Prairie City RD, Malheur NF; high elevation basin.

Eleocharis quinqueflora (E. pauciflora) Association

Few-flowered spikerush Association
34 plots. CEGL001836



Ecoregional Range
BM, BR, EC, WC

Environment and Soils
The Few-flowered spikerush Association is abundant throughout the Cascade, Wallowa, and Elkhorn Mountains, but is scattered in the Yamsey, Gearhardt, Strawberry and Steens Mountains. Landforms supporting the few-flowered spikerush association are found in headwater basins. Elevations are moderate to high. Fens develop in zones of abundant rainfall (more than 100 cm/year), cool climate, and short growing season. Sites are poorly drained basins and flats or seeps that are conducive to cold water saturated soil development (Gorham 1957). In the Blue Mountains, this association occurred where shallow drainage ways cross headwater basin meadows, often where no true stream channel has formed.

Soils range from sedge to sphagnum and moss peats. Occasionally, a bog develops on organic root mats floating on mucky seeps and springs. Available water holding capacity is high. Soil surfaces are saturated through most of the summer. Peat formation is due to slow plant decomposition in waterlogged sites (Gorham1957). Low dissolved oxygen and water temperatures, lack of fluctuation in the water table, cold water temperature, plus concentrations of organic and mineral acids (tannins, etc) in the water table all contribute to slow decomposition of plant residues, resulting in peat accumulation. Long periods of drought may dry the surfaces of peat soils, starting a trend where decomposition exceeds buildup or where fire drastically lowers the soil surface. However, in the long run fen and bog associations are self perpetuating. The eventual climax is probably a larger, deeper fen or bog and not forest.

Valley Environment	Average	Range
Elevation (ft)	6273	4700-7600
Plot Slope (%)	4	0-25
Valley Width (m)	134	65-350
Valley Gradient (%)	5	1-25
Valley Sideslopes (%)	44	15-70
Soil Characteristics		
Current Water Table Depth (cm)	7	+20-70
Thickness of Surface Organic Layer (cm)	45	10-99
Soil Surface Cover (%)		
Submerged	30	0-95
Bare Ground	11	0-90
Rock	tr	0-1
Cryptogam	52	0-98
Litter	24	0-85

Adjacent Vegetation
Adjacent upland vegetation types are generally subalpine fir (*Abies lasiocarpa*) associations (such as subalpine fir/grouse huckleberry (*Vaccinium scopulorum*) and subalpine fir/Labrador tea (*Ledum glandulosum*)) or mountain hemlock (*Tsuga mertensiana*) associations.

Successional Dynamics
Chadde *et al.* (1998) state that "[d]ue to their great mass of water-holding organic matter, peatlands are exceptionally stable and may persist for centuries. In the absence of disturbance, peatlands support autogenic or self-perpetuating communities". Thus, the Few-flowered spikerush (*Eleocharis quinqueflora*) Association is unlikely to succeed to other associations.

Vegetation Composition

Few-flowered spikerush is usually dominant but may be codominant with other plant species. Moss is usually high in cover. However, a few flat fens were semi-permanently flooded and had little or no moss cover. Here, the mosses may become more prominent during drier climatic cycles. Tufted hairgrass and slender and muhly were present on most plots but often had very low cover. Normally robust sedges such as aquatic, bladder, Holm's and Sitka sedge (*Carex aquatilis* var. *dives*) have a surprising ability to persist in a dwarfed, scattered form on these unfavorable sites. Other sedges include Jones sedge, woodrush sedge and star sedge (*Carex echinata*). Nevada rush (*Juncus nevadensis*) is common in some stands. A wide variety of forbs are scattered through the site. Dwarf shrubs such as bog birch (*Betula nana*), alpine laurel (*Kalmia microphylla*), and Booth, undergreen, and Eastwood willows (which are dwarfed due to site conditions) are inconspicuous and restricted to dry microsites. Engelmann spruce (*Picea engelmannii*), lodgepole pine (*Pinus contorta*), subalpine fir (*Abies lasiocarpa*) and mountain hemlock (*Tsuga mertensiana*) are dwarfed and scattered.

Sites with slightly undulating surfaces display a considerable amount of vegetative diversity even though the difference in height between water paths and hummocks is only a few cms. Often the water paths have very little moss cover and are dominated by litter or organic soil. Few-flowered spikerush dominates the herbaceous layer and there are fewer grasses, sedges, and forbs. Mud sedge (*Carex limosa*) is also associated with the water paths. Other sedges, mosses, and forbs are more abundant on thehummocks. Kovalchik (1987) found that great sundew (*Drosera anglica*) often grows in the water paths while roundleaf sundew (*Drosera* rotundifolia) grows on the edges of the hummocks. Aquatic plants such as bog buckbean (*Menyanthes trifoliata*) and bladderworts (*Utricularia* spp.) may grow in flooded water paths. The average height of herbaceous vegetation is approximately 10 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Few-flowered spikerush (*Eleocharis quinqueflora*)	100	44	5-95
Holm's sedge (*Carex scopulorum*)	52	18	1-60
Bladder sedge (*Carex utriculata*)	39	4	1-15
Aquatic sedge (*Carex aquatilis*)	36	11	1-30
Jones sedge (*Carex jonesii*)	36	6	1-15
Woodrush sedge (*Carex luzulina*)	30	10	1-40
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	55	6	1-30
Slender muhly (*Muhlenbergia filiformis*)	36	9	1-40
PERENNIAL FORBS			
Primrose monkey-flower (*Mimulus primuloides*)	52	7	1-20
Elephant's head (*Pedicularis groenlandica*)	42	3	1-15
Ladies tresses (*Spiranthes romanzoffiana*)	39	1	1-5
Bog saxifrage (*Saxifraga oregana*)	33	6	1-18
Alpine shooting star (*Dodecatheon alpinum*)	33	5	1-40
American bistort (*Polygonum bistortoides*)	30	2	1-5
Bog St. John's wort (*Hypericum anagalloides*)	30	8	1-50

Other Studies Documenting Association with Plot Data

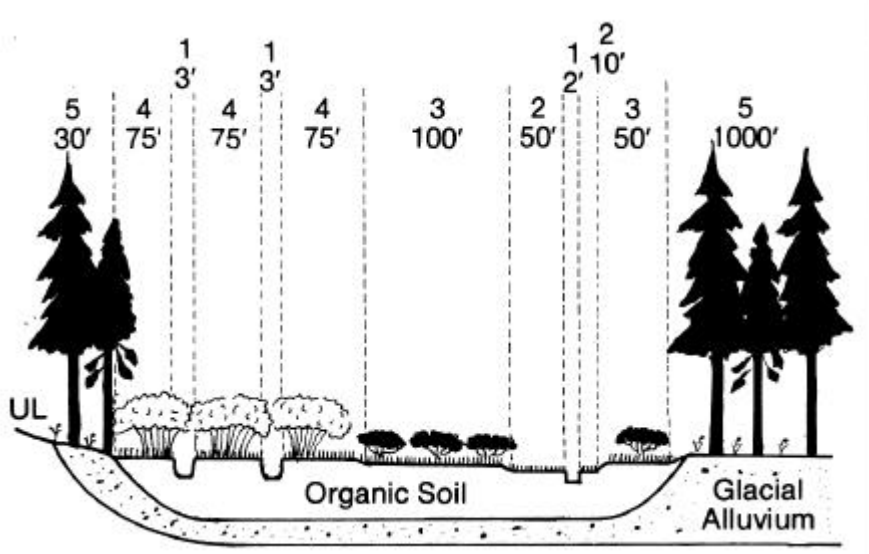
Oregon: Seyer 1979:37, 38; Wilson 1986:19, 20; Crowe & Clausnitzer 1997:199 (in part); Kovalchik 1987: 110; Murray 2000
Washington: Kovalchik 2001
Montana: Hansen *et al.* 1995
Alaska: Boggs 2000
Nevada: Manning and Padget 1992
Colorado: Kittel *et al.* 1999
Utah and southeastern Idaho: Padgett *et al.* 1989

Other Studies Documenting Association without Plot Data

Oregon: Cole 1977:102; Cole 1982:22

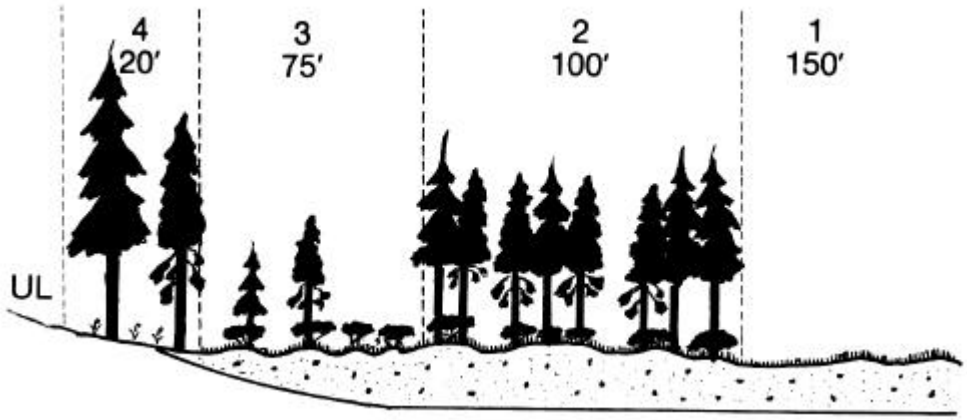
Illustrations

1.Little Cultus Creek, first-order
2.**Few-flowered spikerush,** bog
3.**Bog blueberry/Sitka sedge,** bog
4.**Willow/Sitka sedge,** wet shrub meadow
5.**Engelmann spruce/queencup beadlily**, transition slope and lake terrace



Little Cultus Marsh; flat, mod elevation lake basin; Deschutes Cascades Physiographic Area.

1. **Few-flowered spikerush**, bog
2. **Lodgepole pine/few-flowered spikerush**, bog
3. **Bog blueberry/few-flowered spikerush**, bog
4. Engelmann spruce/queencup beadlily,transition slopes



Cascade Lakes Highway Bog (near WireMeadow); low gradient, mod elevation basin;Deschutes Cascades Physiographic Area.

Juncus balticus Association

Baltic rush Association
26 plots. CEGL001838

Ecoregional Range
BM, BR, CB, CR, EC, KM, WC, WV

Environment and Soils
The JUBA community type is widespread. It is found at moderate elevations in moderately wide to wide, low gradient, trough- and flat-shaped valleys with gentle to moderately steep side slopes. Sites are dry to wet basins, floodplains, and springs. Stream data is limited. Where streams are present the reach types are Rosgen C3, C4, C6, E4, E6 and F4. Stream widths are 0.5 m. to more than 10m wide. Soils are Entisols (Mollic Endoaquents and Typic Fluvaquents) and Mollisols (Endoaquolls). Most of the soils are fine textured and have high water holding capacity. Most sites are flooded during the spring and early summer. The water table drops to about 50 cm of the soil surface late in the growing season.

Vegetation Composition
Baltic rush cover ranges from 20-99%. Cover by other graminoids is usually low. Cover by forbs can be low or high. Forb composition varies, but the most constant species are those that indicate ground disturbance. Average height of herbaceous vegetation is 45 cm, ranging from 30 to 60.

Valley Environment	Average	Range
Elevation (ft)	4761	3000-6550
Plot Slope (%)	2	0-5
Valley Width (m)	183	65-350
Valley Gradient (%)	2	1-5
Valley Sideslopes (%)	33	15-70
Soil Characteristics		
Current Water Table Depth (cm)	44	10-76
Depth to Redoximorphic Features (cm)	25	0-69
Soil Surface Cover (%)		
Submerged	2	0-20
Bare Ground	6	0-40
Gravel	tr	0-2
Rock	1	0-10
Cryptogam	16	0-80
Litter	58	0-100

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Baltic rush (*Juncus balticus*)	100	48	20-99
Woolly sedge (*Carex pellita*)	29	7	1-15
Nebraska sedge (*Carex nebrascensis*)	29	4	1-15
Slender-beaked sedge (*Carex athrostachya*)	25	5	1-15
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	96	14	1-45
Common timothy (*Phleum pratense*)	46	9	1-30
Tufted hairgrass (*Deschampsia caespitosa*)	33	5	1-15
Meadow barley (*Hordeum brachyantherum*)	25	4	1-5
PERENNIAL FORBS			
Western yarrow (*Achillea millefolium*)	67	5	1-12
Northwest cinquefoil (*Potentilla gracilis*)	50	4	1-10
Large-leaf avens (*Geum macrophyllum*)	38	6	1-23
Dandelion (*Taraxacum officinale*)	33	2	1-10
Oregon checker mallow (*Sidalcea oregana*)	33	1	1-3
Hairy willow-herb (*Epilobium ciliatum*)	33	4	1-15

Adjacent Vegetation

Adjacent upland vegetation types include Ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*), grand fir (*Abies grandis*), western juniper (*Juniperus occidentalis*) and sagebrush (*Artemisia*) associations.

Successional Dynamics

This association is thought to occur on sites formerly occupied by several associations, including woolly sedge (*Carex pellita*), aquatic sedge (*Carex aquatilis*), tufted hairgrass (*Deschampsia caespitosa*), and Nebraska sedge (*Carex nebrascensis*). Observation of the elevation, valley type, fluvial surface, stream type and present condition, and patches of remnant native vegetation are important in determining the original late seral vegetation.

Other Studies Documenting Association with Plot Data

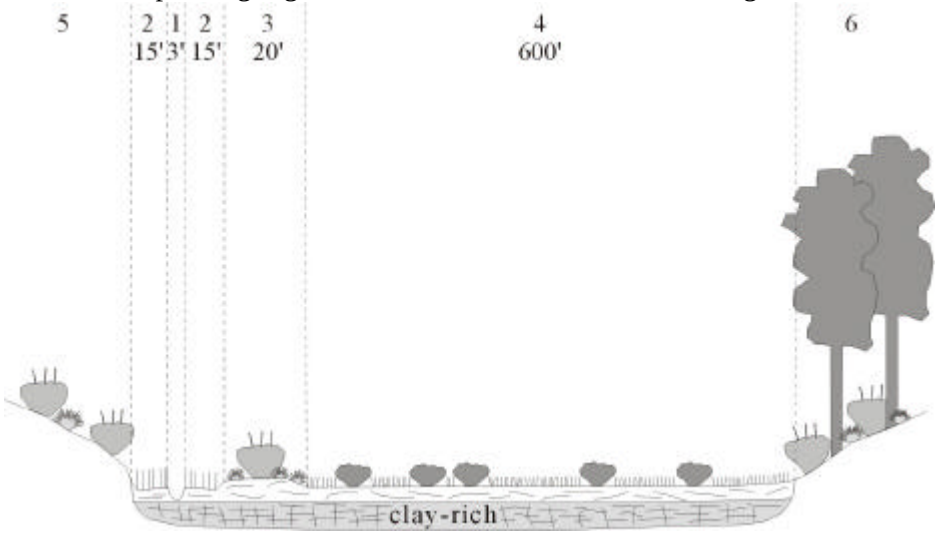
Oregon: Volland 1976:20; Taylor & Frenkel 1979:60; Taylor 1980:57; Padgett 1981:73; Henderson & McAllister 1983:2; Kovalchik 1987:138; Evenden 1990:47; Titus & Christy 1996a, 1999; Crowe and Clausnitzer 1997; Murray 2000; BLM E.S.I. for southeastern OR
Washington:); Kunze 1994:22 (Washington: Kovalchik 2001);
Nevada: Manning and Padget 1992
Montana: Hansen *et al.* 1995
Idaho: Jankovsky-Jones *et al.* 2001
Colorado: Kittel *et al.* 1999
Wyoming and eastern Idaho: Youngblood *et al.* 1985
Utah and southeastern Idaho: Padgett *et al.* 1989

Other Studies Documenting Association without Plot Data

Oregon: Kierstead & Pogson 1976:1-13

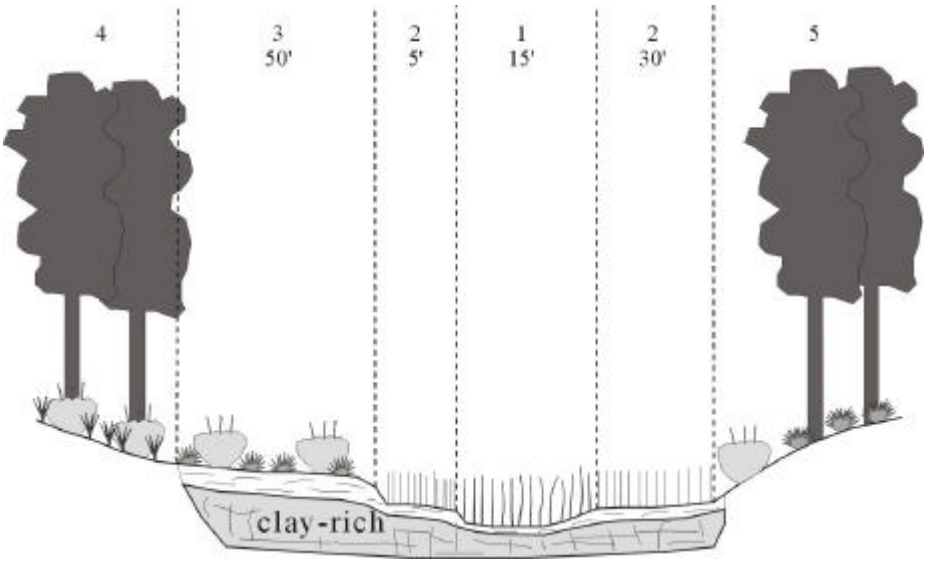
Illustrations

1.E4 stream reach
2.**Baltic rush**, floodplain
3.**Big sagebrush/Cusick's bluegrass**, terrace
4.**Shrubby cinquefoil/Kentucky bluegrass**, moist meadow
5.Big sagebrush/Idaho fescue-bluebunch wheatgrass, northeast-facing toeslope
6.Ponderosa pine/big sagebrush/Idaho fescue-bluebunch wheatgrass, southwest-facing toeslope



Wickiup Creek, Bear Valley RD, Malheur NF; mod. gradient, mod. high elevation, trough-shaped valley

1.**Nebraska sedge**-filled F6 stream reach
2.**Baltic rush**, floodplain
3.**Big sagebrush/Cusick's bluegrass**, terrace
4.Ponderosa pine/big sagebrush/elk sedge, southwest-facing sideslope
5.Ponderosa pine/Idaho fescue-bluebunch wheatgrass, northeast-facing sideslope
6.



S. Fk.Trout Creek, Burns RD, Malheur NF; very low gradient, mod. high elevation, trough-shaped valley

Juncus nevadensis Association

Nevada rush Association
8 plots. New type

Ecoregional Range
BM, BR, EC

Environment and Soils
This association occurs at moderate elevations in moderately wide to wide, low gradient open valleys. Sites appear to be shallow ice worked shores of ponds and lakes, swales and moist meadows. Soils are sedimentary and sedge peats or organic loam. This association is found on stream orders 1, 2, 3, and 4.

Valley Environment	Average	Range
Elevation (ft)	4693	4150-5300
Plot Slope (%)	0.5	0-1
Valley Width (m)	350	--
Valley Gradient (%)	1	--
Valley Sideslopes (%)	15	--
Soil Characteristics		
Current Water Table Depth (cm)	+27	+15-+40
Thickness of Surface Organic Layer (cm)	25	20-35
Soil Surface Cover (%)		
Submerged	60	0-100
Bare Ground	14	0-60
Litter	26	0-100

Vegetation Composition
Nevada rush generally dominates the herbaceous layer. Other graminoids are occasionally codominant. Forbs include bladderworts, pondweeds (*Potamogeton* spp.), and bog buckbean in sites along lake edges and meadow arnica, hairy willow-herb, and skullcap speedwell in meadow sites.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Nevada sedge (*Juncus nevadensis*)	100	31	15-38
Baltic rush (*Juncus balticus*)	57	8	1-15
Creeping spikerush (*Eleocharis palustris*)	57	8	3-15
Inflated sedge (*Carex vesicaria*)	43	9	5-15
Nebraska sedge (*Carex nebrascensis*)	43	5	1-15
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	57	8	1-15
Bluejoint reedgrass (*Calamagrostis canadensis*)	43	3	1-5
PERENNIAL FORBS			
Flatleaf bladderwort (*Utricularia intermedia*)	57	11	1-25
Hairy willow-herb (*Epilobium ciliatum*)	43	1	--
Skullcap speedwell (*Veronica scutellata*)	43	1	--
Meadow arnica (*Arnica chamissonis*)	29	23	8-37
Creeping buttercup (*Ranunculus flammula*)	29	10	5-15
Bog buckbean (*Menyanthes trifoliata*)	25	6	5-7

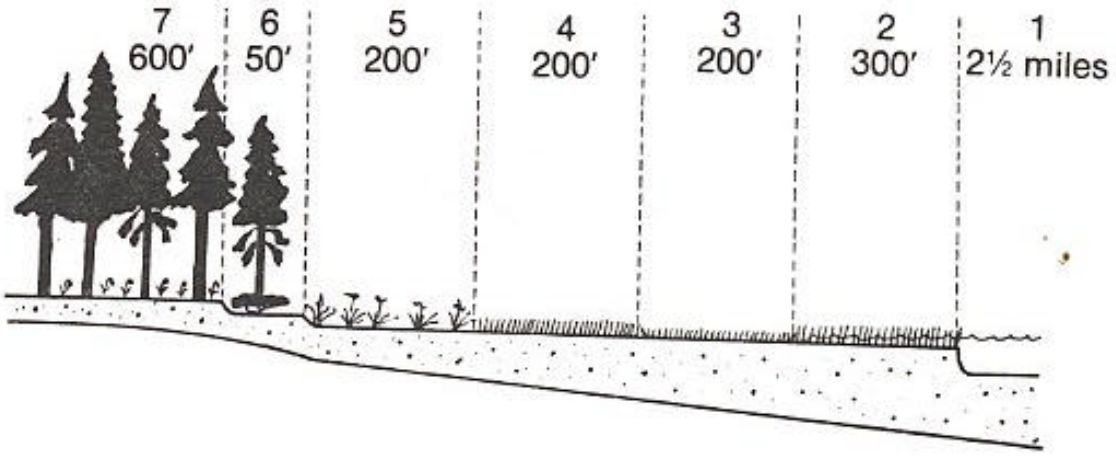
Other Studies Documenting Association with Plot Data

Oregon: Christy & Cornelius 1980:plot 6, 24; Kovalchik 1987:138; Titus & Christy 1996a, 1999

Nevada: Manning and Padget 1992

Illustrations

1.Lake of the Woods
2.**Inflated sedge**, permanently flooded shore
3.**Nevada rush**, semi-permanently flooded shore
4.**Slender sedge**, semi-permenently flooded shore
5.**Tufted hairgrass**, moist meadow
6.**Lodgepole pine/bog blueberry/widefruit sedge**, forested wetland
7.**Engelmann spruce/queencup beadlily**, terrace



Lake of the Woods; mod-low elevation lake basin; Winema Cascades Physiographic Area.

Schoenoplectus americanus Association

Three-square bulrush Association
4 plots. CEGL001843

Valley Environment	Average	Range
Elevation (ft)	2930	2550-3400
Plot Slope (%)	2	1-3
Valley Width (m)	110	65-200
Valley Gradient (%)	2	--
Valley Sideslopes (%)	43	15-70
Soil Surface Cover (%)		
Submerged	18	5-30
Bare Ground	40	20-60
Gravel	28	1-55
Rock	15	10-20
Litter	1	--

Ecoregional Range

BM, BR, CR, EC, KM, WC, WV. This association is on the Heritage list for Idaho.

Environment and Soils

The Three-square bulrush Association occurs at low elevations throughout the state of Oregon. Sites are alluvial bars and streambanks, often along larger perennial streams and rivers. Sites are submerged by spring runoff and may be completely dry at the surface by mid summer. The water table, however, generally remains within the rooting zone throughout the growing season.

Vegetation Composition

Three square bulrush dominates the site, although creeping spikerush and Baltic rush may form large patches. Small amounts of introduced grasses were present. A variety of forbs are scattered across the sites in small amounts. Mean percent total cover is 124, ranging from 106-144%. Mean richness is 21, ranging from 14-36. Average height of herbaceous vegetation is approximately 40 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Coyote willow (*Salix exigua*)	75	4	1-8
SEDGES and RUSHES			
Threesquare bulrush (*Schoenoplectus americanus*)	100	53	30-90
Creeping spikerush (*Eleocharis palustris*)	100	19	1-30
Baltic rush (*Juncus balticus*)	50	8	1-15
PERENNIAL GRASSES			
Creeping bentgrass (*Agrostis stolonifera*)	50	2	1-3
Reed canarygrass (*Phalaris arundinacea*)	50	1	--
PERENNIAL FORBS			
Field mint (*Mentha arvensis*)	75	1	1-3
Western water hemlock (*Cicuta douglasii*)	50	8	1-15
Mexican whorled milkweed (*Asclepias fascicularis*)	50	6	3-8
Catnip (*Nepeta cataria*)	50	4	1-8
Curly dock (*Rumex crispus*)	50	1	--
Arumleaf arrowhead (*Sagittaria cuneata*)	50	1	--
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	75	3	1-8

Adjacent Vegetation

Upland vegetation adjacent to sites sampled included western juniper (*Juniperus occidentalis*)/big sagebrush (*Artemisia tridentata*)/Great Basin wildrye (*Leymus cinereus*), big sagebrush/bluebunch wheatgrass (*Pseudoroegneria spicata*), big sagebrush-bitterbrush (*Purshia tridentata*)/bluebunch wheatgrass and gray rabbitbrush (*Ericameria nauseosa* ssp. *nauseosa*)/cheatgrass (*Bromus tectorum*).

Successional Dynamics

These sites are prone to frequent flooding and erosion and deposition of sediments. With increased stability on the site, the development of willow associations may occur.

Other Studies Documenting Association with Plot Data
Oregon: Kierstead and Pogson 1976: 1-12
Idaho: Jankovsky-Jones *et al.* 2001

Other Studies Documenting Association without Plot Data
Oregon: Copeland 1979: HL-14

Scirpus microcarpus Association

Small-fruited bulrush Association
39 plots. New type

Ecoregional Range
BM, BR, CB, EC

Environment and Soils
The SCMI association occurs throughout the Blue Mountains. Sites were sampled on Heppner, Walla Walla, and North Fork John Day RDs (Umatilla NF); Long Creek, Bear Valley, Burns, and Prairie City RDs (Malheur NF); and La Grande RD (Wallow--Whitman NF). It is found at moderate elevations (4080 to 5845 ft.) in 15-650 ft. wide, variable gradient (2-10%), trough- and V-shaped valleys with gentle to moderately steep side slopes. Sites are floodplains, wet basins (fens), and springs. Rosgen stream types are B3, B4, C3, C4 and E6. Stream widths are 1-50 ft. wide. Woody debris affects 0-30% of the stream channel. Soils are Entisols (Mollic and Typic Endoaquents and Typic Fluvaquents) and Mollisols (Fluvaquentic and Typic Endoaquolls) and have silt loam to sandy loam to gravelly loam textures. This association develops on fresh alluvial deposits. Floodplains and wet meadows are usually flooded in late spring, and the water table is within 50 cm of the soil surface late in the growing season.

Small-fruit bulrush (bigleaf sedge) is infrequent on the Winema National Forest and common on the other three National Forests. It has been observed in the LaPine Basin, Low Flanks Cascades, Grasslands, Ochoco Mountains, and Basin and Range Physiographic Areas. Elevations are low to moderate (2400-5700 feet). It occurs on seral, water worked sites on overflow channels, active channel shelves, active floodplains, and wet meadows and basins. Small-fruit bulrush and bigleaf sedge will be replaced by other sedges or mountain alder as the fluvial surfaces mature.

Valley Environment	Average	Range
Elevation (ft)	4720	3000-5845
Plot Slope (%)	4	0-21
Valley Width (m)	67	5-350
Valley Gradient (%)	3	1-12
Valley Sideslopes (%)	31	15-70
Soil Characteristics		
Current Water Table Depth (cm)	27	+10-110
Thickness of Surface Organic Layer (cm)	38	8-70
Soil Surface Cover (%)		
Submerged	9	0-75
Bare Ground	23	0-90
Gravel	1	0-10
Rock	2	0-40
Cryptogam	17	0-95
Litter	41	0-100

Active channel shelf soils are water worked alluvium. Textures are coarse sandy loam to fine sandy loam. Cobble and gravels are often prominent at early stages of development but become covered by sandy loam soils as riparian vegetation filters and traps stream sediments. Overflow channels, scour channels, and cutoff channels are active fluvial surfaces where water forces are low and stream sediments and organic matter are rapidly building the soil profile. Here, soil textures range from silts to fine sandy loams, organic loams, and mucks. Wet meadow soils are organic loam or sedge peat except for recent mineral deposits associated with the flood

event that created the opportunity for small-fruit bulrush and/or bigleaf sedge invasion. Available water holding capacity is moderate to high. Active channel shelves and overflow channels are flooded during spring runoff. Meadows are flooded into June or July and the water table is within 20 inches of the soil surface in August and September.

Vegetation Composition

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Smallfruit bulrush (*Scirpus microcarpus*)	100	65	20-100
Swordleaf rush (*Juncus ensifolius*)	46	2	1-10
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	56	7	1-20
Kentucky bluegrass (*Poa pratensis*)	41	4	1-15
PERENNIAL FORBS			
Hairy willow-herb (*Epilobium ciliatum*)	54	2	1-10
Large-leaf avens (*Geum macrophyllum*)	51	5	1-23
American speedwell (*Veronica americana*)	46	3	1-10
Yellow monkeyflower (*Mimulus guttatus*)	44	3	1-10

Small-fruit bulrush dominates. Mountain alder (*Alnus incana*) and prickly currant (*Ribes lacustre*) is often present on active channel shelves in moderately graded floodplain landforms. Graminoids such as swordleaf rush, woolly sedge (*Carex pellita*), widefruit sedge (*Carex angustata*), aquatic sedge (*Carex aquatilis*) and bladder sedge (*Carex utriculata*) and grasses such as tall mannagrass and weak alkaligrass (*Torreyochloa pallida* var. *pauciflora*) are common. Forbs are more abundant on active channel shelves, banks, and overflow channels than in meadows. Average height of herbaceous vegetation is 60 cm, ranging from 40 to 80 cm.

Adjacent Vegetation

Vegetation types adjacent to sites sampled are in the Blue Mountains are:
terraces " Engelmann spruce (*Picea engelmannii*)/grouse huckleberry (*Vaccinium scopulorum*), Lodgepole pine (*Pinus contorta*)/pinegrass (*Calamagrostis rubescens*), grand fir (*Abies grandis*) /Pacific yew (*Taxus brevifolia*)/queen's cup beadlily (*Clintonia uniflora*), other spruce communities;
sideslopes" subalpine fir (*Abies lasiocarpa*)/ big huckleberry (*Vaccinum membranaceum*), grand fir/twinflower (*Linnaea borealis*), grand fir/Pacific yew/queen's cup beadlily and other lodgepole pine and grand fir communities.

Successional Dynamics

With overuse by grazing ungulates, other graminoids and forbs become codominant with small-fruit bulrush. The soilsurface is trampled and broken and streambank and channel erosion are evident. With continued overuse, other graminoids and forbs become dominant and sites may convert to the Baltic rush Association.

Other Studies Documenting Association with Plot Data

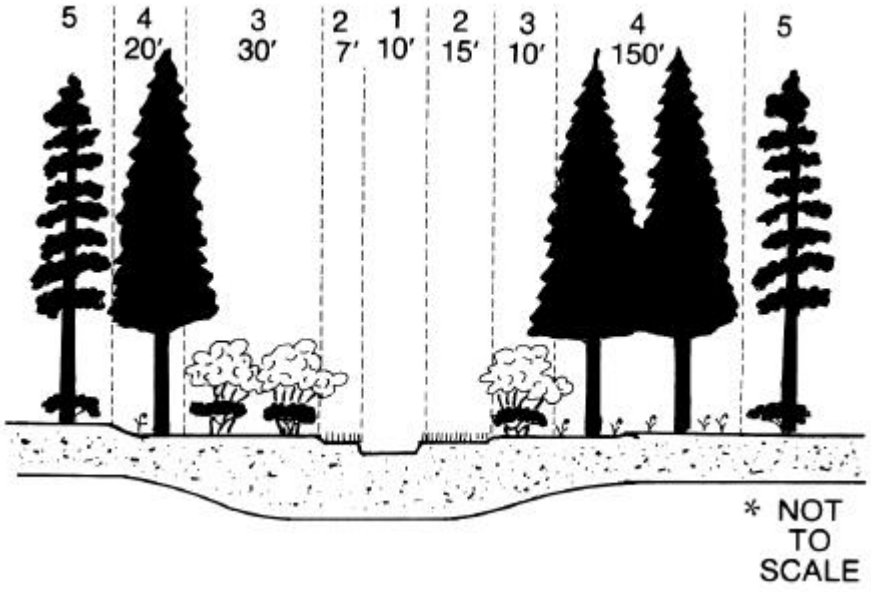
Oregon: Frenkel et al. 1978:82; Ganskopp 1979:39;); Boss 1983:113; Kovalchik 1987:112; Evenden 1990:44; Diaz & Mellen 1996:187; Titus 1996; Crowe and Clausnitzer 1997; Murray 2000;
Washington: ; Henderson & Peter 1982:76; Kovalchik 2001

Other Studies Documenting Association without Plot Data

Oregon: Glad et al. 1987:261
Idaho: Jankovsky-Jones *et al.* 2001
Nevada: Manning and Padget 1992

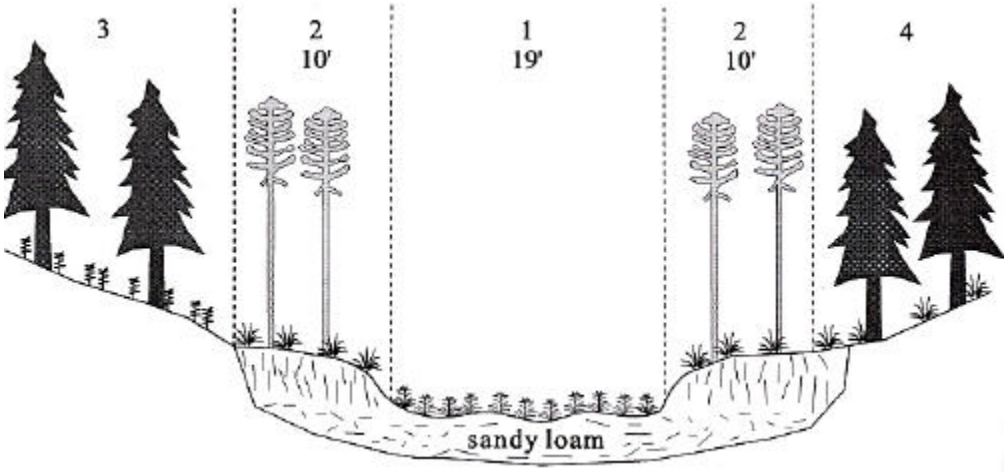
Illustrations

1.Lake Creek, third-order
2.**Small-fruit bulrush**, active channel shelves
3.**Mountain alder-common snowberry**, active floodplain
4.**White fir/queencup beadlily**, inactive floodplain
5.**Ponderosa pine/common snowberry-floodplain**, terrace



Lake Creek; mod-low gradient, low elevation floodplain; Low Flanks Cascades Physiographic Area.

1.**Small-fruit bulrush**, swale with shallow subsurface water
2.Lodgepole pine/pinegrass, terraces
3.Grand fir/birchleaf spirea, east-facing sideslope
4.Grand fir/pinegrass, west-facing sidelope



Trib. To Middle Fk. Wolf Creek, Burns RD, Malheur NF; mod. gradient, mod. high elevation, V-shaped valley

GRASS ASSOCIATIONS

Agrostis pallens Association

Thin bentgrass Association
4 plots. CEGL001600

Valley Environment	Average	Range
Elevation (ft)	5233	4650-5600
Plot Slope (%)	3	1-5
Valley Width (m)	205	65-350
Valley Gradient (%)	12	2-30
Valley Sideslopes (%)	25	15-45
Soil Characteristics		
Rooting Depth (cm)	29	18-40
Soil Surface Cover (%)		
Bare Ground	7	4-10
Gravel	1	0-2
Rock	1	0-2
Cryptogam	9	3-18
Litter	8	5-15

Ecoregional Range
BM

Environment and Soils
Sites sampled were in low to moderate gradient, narrow to wide, trough-shaped meadows that are usually in the headwaters of the drainage basin. Streams found in these meadows were 0.5-5m wide Rosgen F streams with gravel to silt/clay substrates. These streams were probably Rosgen C and/or E streams before they were degraded. The water table is well below the rooting zone by late spring.

Vegetation Composition
Thin bentgrass is relatively abundant is tufts that are evenly dispersed across the site. Colorado rush, Baltic rush and groundsel are more abundant on degraded sites.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Colorado rush (*Juncus confusus*)	75	18	10-29
Baltic rush (*Juncus balticus)*	50	20	12-28
PERENNIAL GRASSES			
Thin bentgrass (*Agrostis pallens*)	100	26	12-55
Common timothy (*Phleum pratense*)	75	5	1-10
Slender hairgrass (*Deschampsia elongata*)	50	6	1-10
Western needlegrass (*Stipa occidentale* ssp. *occidentale*)	50	1	--
PERENNIAL FORBS			
Dandelion (*Taraxacum officinale*)	75	7	2-15
Gairderi' s yampah (*Perideridia gairdneri*)	75	6	1-8
Groundsel (*Senecio* spp).	50	19	17-20
Cinquefoil (*Potentilla* spp).	50	4	2-5
Yarrow (*Achillea millefolium*)	50	2	1-2
ANNUAL FORBS			
Tall annual willow-weed (*Epilobium paniculatum*)	50	5	4-5

Adjacent Vegetation
Upland associations adjacent to sites sampled are: terraces: Ponderosa pine/Common snowberry; Low sagebrush/Sandberg' s bluegrass ; Big sagebrush/Geyer' s sedge; Tufted hairgrass; sideslopes: Ponderosa pine/Big sagebrush/Geyer' s sedge; Big sagebrush/Geyer' s sedge; Douglas' fir/Geyer' s sedge, Low sagebrush/Sandberg' s bluegrass.

Successional Dynamics
This association may be the result of heavy livestock grazing on drier Tufted hairgrass (*Deschampsia caespitosa)* meadows (Crowe and Clausnitzer 1997).

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997: 201; Hall 1973 described a moist meadow community that corresponds to the *Agrostis pallens* Association.

Calamagrostis canadensis Association

Bluejoint reedgrass Association
12 plots. CEGL001559

Valley Environment	Average	Range
Elevation (ft)	5368	4760-7350
Plot Slope (%)	2	0-5
Valley Width (m)	90	20-200
Valley Gradient (%)	3	2-5
Valley Sideslopes (%)	38	15-70
Soil Characteristics		
Thickness of Organic Layer (cm)	39	10-117
Rooting Depth (cm)	43	23-66
Depth to Redox Features (cm)	17	10-25
Current Water Table Depth (cm)	47	23-70
Soil Surface Cover (%)		
Submerged	2	0-20
Bare Ground	10	0-50
Rock	tr	0-1
Cryptogam	15	0-60
Litter	72	30-100

Ecoregional Range
BM, EC

Environment and Soils
This association is found at moderate to high elevations in somewhat narrow to wide trough- and flat-shaped valley bottoms. Sites are wet basins, floodplains and springs. Where present Rosgen stream types are C3, C4, E4, E5 and E6. Most soils consist of 15-70 cm of fine-textured (clay loam, silty clay loam , silt loam or fine sandy loam) material over coarse-fragment rich buried stream beds. Two soils are peats and one had a very organic-rich surface horizon. Sites adjacent to streams are often flooded during spring runoff, and the water table drops to 50-80 cm below the soil surface by late summer.

Vegetation Composition
Bluejoint reedgrass dominates the site in an evenly dispersed layer averaging 100 cm in height (ranging from 23 to 180 cm). Aquatic sedge and small-fruit bulrush are sometimes fairly abundant. Forbs are scattered in the herbaceous understory.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Aquatic sedge (*Carex aquatilis*)	58	6	1-16
Small-fruit bulrush (*Scirpus microcarpus*)	42	12	1-30
PERENNIAL GRASSES			
Bluejoint reedgrass (*Calamagrostis canadensis*)	100	73	30-100
Tufted hairgrass (*Deschampsia caespitosa)*	42	4	1-10
PERENNIAL FORBS			
Arrowleaf groundsel (*Senecio triangularis*)	42	9	5-20
Sitka burnet (*Sanguisorba sitchensis*)	42	9	1-30
Western polemonium (*Polemonium occidentale*)	42	4	1-10
Hairy willow-herb (*Epilobium ciliatum*)	42	1	1-2
White bog-orchid (*Habenaria dilatata*)	42	1	--

Adjacent Vegetation
Associations on upland sideslopes adjacent to plots sampled in the Blue Mountains are subalpine fir-Engelmann spruce/grouse huckleberry-twinflower; subalpine fir/twinflower; Douglas fir/pinegrass; and lodgepole pine.

Other Studies Documenting Association with Plot Data
Oregon: Cole 1977: 100; Crowe and Clausnitzer 1997: 38; Kovalchik 1987: 138; Murray 2000.
Washington: Kovalchik 2001
Montana: Hansen *et al.* 1995
Alaska: Boggs 2000
Colorado: Kittel *et al.* 1999
Wyoming-Idaho: Youngblood *et al.* 1985
Utah-Idaho: Padgett *et al.* 1989

Deschampsia caespitosa Association

Tufted hairgrass Association
30 plots. CEGL001599.

Ecoregional Range
BM, BR, EC

Environment and Soils
Tufted hairgrass associations have a broad elevational and geographical distribution in central and eastern Oregon. Several related associations were classified based on vegetative composition. They are: Tufted hairgrass, Tufted hairgrass-Aquatic sedge, Tufted hairgrass-Nebraska sedge, Tufted hairgrass-Timber oatgrass, and Tufted hairgrass-Baltic rush. These latter three types may be successional variants on the Tufted hairgrass Association. Environmental characteristics are variable and not enough data were available to describe the environment and soils for each association so a broad description is given here. Sites are wet, moist and dry basins, floodplains, springs and lakeshores. This association occurs at moderate to high elevations in low gradient, moderately broad to broad, U- and trough-shaped valleys with gentle to moderately steep side slopes. Where streams are present they are C4, C6, and E6 Rosgen types. Stream widths are 0.5-10 m wide.

Soils are variable. On drier sites (generally, but not exclusively, in the Tufted hairgrass and Tufted hairgrass-Timber oatgrass Associations), soils are mineral alluvium. Surface textures are silt, sandy loam,and silty clay loam. On moister sites (generally, but not exclusively, in the Tufted hairgrass-Aquatic sedge, Tufted hairgrass-Nebraska sedge, and Tufted hairgrass-Baltic rush Associations) surface textures range from silt loam to organic loam and sedge peat. Water tables range from near or slightly above the soil surface at snowmelt to 50 to 90 cm below the soil surface by late July and August (September at high elevations). Water levels are generally higher on organic than on mineral soils. Available water holding capacity is moderate to high and soils remain fairly moist through much of the summer. Soil classifications are: Mollisols (Haploborolls and Endoaquolls), Inceptisols (Histic Humaquepts), Entisols (Mollic Endoaquents and Typic Cryaquents), and Histosols (Fluvaquentic Borohemists). This association is found on stream orders 1, 2, 3 and 4.

Vegetation Composition
Tufted hairgrass cover ranges from 25-90% and is the dominant species. Other herbaceous plants are present at low cover, unless the site has been disturbed by grazing. Forbs and graminoids include Northwest cinquefoil, American bistort, common camas, sweetmarsh butterweed, leafy aster, alpine timothy, Baltic rush, small-winged sedge and Nebraska sedge. Kentucky bluegrass, common timothy and meadow foxtail are more common in the more heavily grazed sites.

Valley Environment	Average	Range
Elevation (ft)	5601	4500-7300
Plot Slope (%)	1	0-4
Valley Width (m)	222	65-350
Valley Gradient (%)	2	1-2
Valley Sideslopes (%)	32	15-45
Soil Characteristics		
Current Water Table Depth (cm)	68	23-130
Soil Surface Cover (%)		
Submerged	1	0-9
Bare Ground	15	0-75
Gravel	tr	0-5
Rock	tr	0-10
Cryptogam	10	0-70
Litter	60	1-100

Adjacent Vegetation

Vegetation types adjacent to sites sampled in the Blue Mountains are: terraces - shrubby cinquefoil (*Dasiphora floribunda*), silver sagebrush/Cusick' s bluegrass , ponderosa pine/common snowberry, Big sagebrush/Cusick' s bluegrass, Kentucky bluegrass; sideslopes - grand fir associations, ponderosa pine/big sagebrush/elk sedge.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Baltic rush (*Juncus balticus*)	57	5	tr-15
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	100	49	25-90
Kentucky bluegrass (*Poa pratensis*)	37	9	1-35
Slender muhly (*Muhlenbergia filiformis*)	33	5	1-15
Meadow barley (*Hordeum brachyantherum*)	33	4	1-15
PERENNIAL FORBS			
American bistort (*Polygonum bistortoides*)	47	4	1-15
Long-stalk clover (*Trifolium longipes*)	43	9	1-37
Slender cinquefoil (*Potentilla gracilis*)	37	7	1-30
Meadow arnica (*Arnica chamissonis*)	20	11	1-45
Sweetmarsh butterweed (*Senecio hydrophiloides*)	13	24	1-45
Leafy aster (*Symphyotrichum foliaceum var. foliaceum*)	13	17	2-35

Successional Dynamics

With overgrazing by ungulates, tuftedhairgrass becomes codominant with other graminoids and forbs, irregular in distribution, and reduced in cover (to 15-30 percent). On dry sites the litter layer becomes somewhat disrupted andgrasses such as shortleaved muhly (*Muhlenbergia richardsonis*), prairie junegrass (*Koeleria macrantha*), and timber oatgrass (*Danthonia intermedia*) increase in dominance creating the Tufted hairgrass-Timber oatgrass Association. Baltic rush or Nebraska sedge become codominant with tufted hairgrass on moister sites creating the Tufted hairgrass-Baltic rush and Tufted hairgrass-Nebraska sedge Associations. Herbs such as meadow arnica (*Arnica chamissonis*), and silverweed (*Potentilla anserina*) are common on moist sites.

With continuing overuse, tufted hairgrass vigor is reduced and it becomes subordinant to other graminoids and forbs (canopy cover < 15 per-cent). Bare ground is prominent on dry sites due to the thinning of litter and increased rodent activity. Dry sites are dominated bygraminoids such as shortleaved muhly, Kentucky bluegrass, timber oatgrass, and Baltic rush and have a preponderance of forbs such as long-stalk clover (*Trifolium longipes*) , western yarrow (*Achillea millefolium*) , and western aster (*Aster spathulatum*). Moist sites become dominated by Baltic rush, Nebraska sedge, other sedges, and by large colonies of mesic forbs. These dry and moist sites are Tufted hairgrass-Timber oatgrass, Tufted hairgrass-Baltic rush and Tufted hairgrass-Nebraska sedge Associations in low condition.

Other Studies Documenting Association with Plot Data

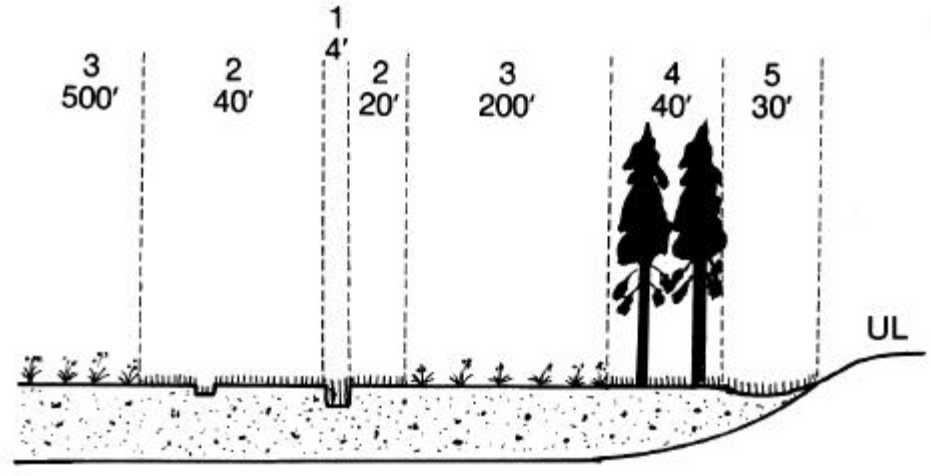
Oregon: Hall 1973: 4,5; Kovalchik 1987: 95; Crowe and Clausnitzer 1997: 190; Murray 2000; NRCS Mountain Meadow and Meadow (010XY002OR & 010XY004OR-Harney County)
Washington: Kovalchik 2001
Montana: Hansen *et al.* 1995
Nevada: Manning and Padgett 1995
Colorado: Kittel *et al.* 1999
Wyoming-eastern Idaho: Youngblood *et al.* 1985
Utah-southwestern Idaho: Padgett *et al.* 1989

Other Studies Documenting Association without Plot Data

Oregon: Titus and Christy 1996a, 1999.

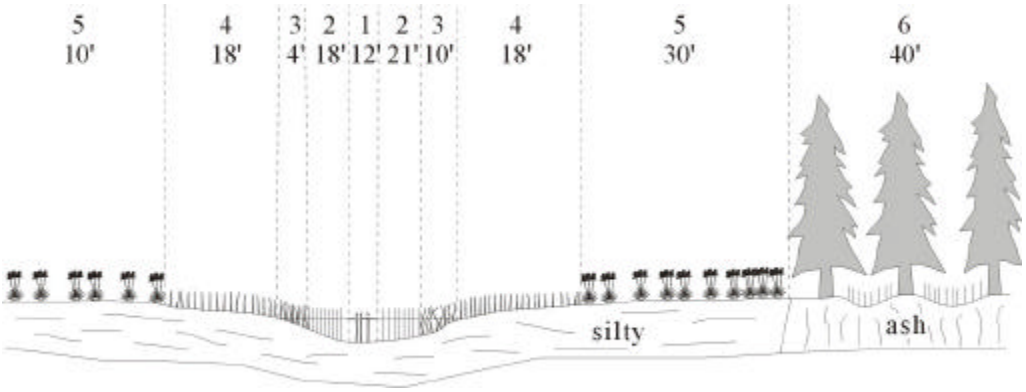
Illustrations

1.**Inflated sedge**, intermittent streambed
2.**Widefruit sedge**, moist meadow
3.**Tufted hairgrass**, dry meadow
4.**Lodgepole pine/widefruit sedge**, forested wetland
5.**Widefruit sedge**, cutoff/overflow channel



O'Connor Meadow; low gradient, mod elevation basin; Pumice-mantled Basin and Range Physiographic Area; Winema National Forest.

1.**Narrow-leaved burreed**, shallow pond
2.**Creeping spikerush**, perimeter of shallow pond
3.**Inflated sedge**, edge of shallow pond
4.**Aquatic sedge**, wet meadow
5.**Tufted hairgrass**, moist meadow
6.**Grand fir/woolly sedge**, forested swamp



Frog Heaven Meadows, La Grande RD, Wallowa-Whitman NF; headwater basin with pond and surrounding meadows.

Deschampsia caespitosa - Carex aquatilis var. aquatilis Association

Tufted hairgrass -Aquatic sedge Association
5 plots. New type

Ecoregional Range
BM, EC

Environment and Soils
see Tufted hairgrass Association

Vegetation Composition
Mean percent total cover is high at 221%, ranging from 140-282%. Mean richness is 17.2, ranging from 7-22.

Valley Environment	Average	Range
Elevation (ft)	5236	4560-5481
Plot Slope (%)	3	2-4
Valley Width (m)	110	65-200
Valley Gradient (%)	2	--
Valley Sideslopes (%)	25	15-45
Soil Surface Cover (%)		
Submerged	tr	0-1
Bare Ground	4	0-5
Cryptogam	18	1-80
Litter	8	3-20

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Aquatic sedge (*Carex aquatilis* var. *aquatilis*)	100	38	20-60
Nebraska sedge (*Carex nebrascensis*)	40	16	12-20
Smallwing sedge (*Carex microptera*)	40	14	8-20
Woodrush sedge (*Carex luzulina*)	40	13	10-15
Field woodrush (*Luzula campestris*)	40	10	5-15
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	100	52	35-65
Kentucky bluegrass (*Poa pratensis*)	80	5	1-12
Slender muhly (*Muhlenbergia filiformis*)	40	15	10-20
Alpine timothy (*Phleum alpinum*)	40	15	--
Winter bentgrass (*Agrostis scabra*)	40	11	2-20
PERENNIAL FORBS			
Bog St. John' s wort (*Hypericum anagalloides*)	60	9	2-15
Hairy willow-herb (*Epilobium ciliatum*)	60	9	1-15
Musk monkeyflower (*Mimulus moschatus*)	60	3	2-5
Woolly groundsel (*Senecio integerrimus*)	40	24	20-28
Long-stalk clover (*Trifolium longipes*)	40	13	10-15

Adjacent Vegetation
see Tufted hairgrass Association

Successional Dynamics
see Tufted Hairgrass Association

Deschampsia caespitosa-Carex nebrascensis Association

Tufted hairgrass-Nebraska sedge Association
5 plots. CEGL001601

Ecoregional Range
BM, BR, EC

Environment and Soils
see Tufted hairgrass Association

Valley Environment	Average	Range
Elevation (ft)	5126	4550-5800
Plot Slope (%)	1	0-2
Soil Surface Cover (%)		
Bare Ground	6	0-10
Rock	tr	0-1
Cryptogam	3	0-7
Litter	58	2-100

Vegetation Composition
Tufted hairgrass, Nebraska sedge, Baltic rush dominate these meadows and riparian bottoms. Slender cinquefoil, common camas and American bistort are common.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Nebraska sedge (*Carex nebrascensis*)	100	17	15-20
Baltic rush (*Juncus balticus*)	100	12	8-15
Smallwing sedge (*Carex microptera*)	40	11	10-12
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	100	33	15-55
Kentucky bluegrass (*Poa pratensis*)	40	18	5-30
Slender muhly (*Muhlenbergia filiformis*)	40	10	2-18
Fowl bluegrass (*Poa palustris*)	20	15	--
PERENNIAL FORBS			
Slender cinquefoil (*Potentilla gracilis*)	80	13	5-35
American bistort (*Polygonum bistortoides*)	60	7	5-8
Common camas (*Camassia quamash*)	60	5	1-10
Meadow arnica (*Arnica chamissonis*)	40	4	3-5

Adjacent Vegetation
see Tufted hairgrass Association

Successional Dynamics
see Tufted Hairgrass Association

Other Studies Documenting Association with Plot Data
Oregon: NRCS Wet Meadow (023XY416OR-Harney County); NRCS Wet Meadow (010XY003OR-Upper Snake River Lava Plains and Hills) 1900
Nevada: Manning and Padgett 1995

Deschampsia caespitosa-Danthonia intermedia Association

Tufted hairgrass-Timber Oatgrass Association
4 plots. CEGL001604.

Ecoregional Range
BM, EC

Environment and Soils
see Tufted hairgrass Association

Valley Environment	Average	Range
Elevation (ft)	5340	4640-6200
Plot Slope (%)	2	1-2
Valley Gradient (%)	2	1-2
Soil Surface Cover (%)		
Submerged	3	0-154
Bare Ground	8	0-15
Gravel	1	0-5
Cryptogam	21	0-75
Litter	66	10-95

Vegetation Composition
Similar to the tufted hairgrass association, this type is characterized by co-dominance of timber oatgrass, which ranges from 10-35% of the total species cover. Forbs tend to be drier, including long-stalk clover, high mountain cinquefoil, and western aster.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	100	45	30-75
Timber oatgrass (*Danthonia intermedia*)	100	23	10-35
PERENNIAL FORBS			
Long-stalk clover (*Trifolium longipes*)	100	10	1-15
High mountain cinquefoil (*Potentilla flabellifolia*)	75	8	2-15
Yarrow (*Achillea millefolium*)	50	13	tr-25
Western aster (*Aster spathulatum*)	50	8	5-10
Ladies tresses (*Spiranthes romanzoffiana*)	50	tr	tr-1
Umber pussytoes (*Antennaria umbrinella*)	25	10	--

Adjacent Vegetation
see Tufted hairgrass Association

Successional Dynamics
see Tufted Hairgrass Association

Deschampsia cespitosa-Juncus balticus Association

Tufted hairgrass-Baltic rush Association
15 plots. New type

Ecoregional Range
BM, BR, EC, WC

Environment and Soils
see Tufted hairgrass Association

Valley Environment	Average	Range
Elevation (ft)	4997	4070-5430
Plot Slope (%)	1	1-2
Valley Width (m)	479	65-350
Valley Gradient (%)	2	1-2
Valley Sideslopes (%)	27	15-45
Soil Characteristics		
Current Water Table Depth (cm)	49	30-86
Soil Surface Cover (%)		
Submerged	1	0-10
Bare Ground	10	0-90
Rock	tr	0-1
Cryptogam	12	0-50
Litter	37	2-95

Vegetation Composition
Mean percent total cover is 135%, ranging from 81-201%. This is often not a diverse association, with mean richness at 12.6, ranging from 5-21. Baltic rush is always co-dominant with tufted hairgarss, and the two generally comprise most of the vegetation at these sites.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Baltic rush (*Juncus balticus*)	100	30	10-75
Nebraska sedge (*Carex nebrascensis*)	33	14	7-25
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	100	55	20-97
Kentucky bluegrass (*Poa pratensis*)	27	11	1-35
Slender muhly (*Muhlenbergia filiformis*)	27	5	1-15
PERENNIAL FORBS			
Slender cinquefoil (*Potentilla gracilis*)	53	11	tr-45
Hairy willow-herb (*Epilobium ciliatum*)	47	1	tr-3
Common camas (*Camassia quamash*)	40	4	1-12
American bistort (*Polygonum bistortoides*)	33	3	1-8
Woolly groundsel (*Senecio integerrimus*)	27	8	2-20

Adjacent Vegetation
see Tufted hairgrass Association

Successional Dynamics
see Tufted Hairgrass Association

Other Studies Documenting Association with Plot Data
Oregon: Volland 1976: 21; Hopkins 1979a: 12; Titus and Christy 1996a, 1999

Elymus glaucus Association

Blue wildrye Association
3 plots. CEGL001565

Ecoregional Range
BM, CR, EC

Environment and Soils
Plots were sampled in the Evening Creek and Mountain Lakes Wilderness and on Gearhardt Mountain. Sites are dry floodplains and basins at moderate elevations. Soils are deep loams that are saturated at snow melt but droughty by mid to late summer. This plant association is found on stream orders 1, 2 and 3.

Valley Environment	Average	Range
Elevation (ft)	5927	5600-6380
Plot Slope (%)	11	2-15
Valley Gradient (%)	11	2-15
Soil Surface Cover (%)		
Bare Ground	28	0-70
Gravel	1	0-2
Rock	8	0-25
Cryptogam	31	2-70
Litter	29	1-80

Vegetation Composition
Blue wildrye is the dominant graminoid. Mean percent cover is 172%, ranging from 165-200%. This is a diverse association with a mean richness of 32.8, ranging from 14-46. This association may have occurred in dry headwater basins in the southern Blue Mountains but now be repaced by seeded domestic grasses.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SUBDOMINANT TREES			
Lodgepole pine (*Pinus contorta*)	67	4	3-5
UNDERSTORY TREES			
Grand fir (*Abies grandis*)	67	5	2-7
Lodgepole pine (*Pinus contorta*)	67	2	--
SEDGES and RUSHES			
Thick-headed sedge (*Carex pachystachya*)	67	4	1-7
Field woodrush (*Luzula campestris*)	67	1-2	
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	100	38	25-65
Mountain brome (*Bromus carinatus*)	100	5	--
Alpine timothy (*Phleum alpinum*)	67	1	--
PERENNIAL FORBS			
Yarrow (*Achillea millefolium*)	100	4	2-5
Dandelion (*Taraxacum officinale*)	100	2	1-3
Bigleaf lupine (*Lupinus polyphyllus*)	67	33	5-60
Vetch (*Lathyrus* spp.)	67	18	15-20
California false hellebore (*Veratrum californicum*)	67	14	7-20
Arrowleaf groundsel (*Senecio triangularis*)	67	10	5-15
Starry false Solomon' s seal (*Maianthemum stellata*)	67	2	--
Columbia monkshood (*Aconitum columbianum*)	67	2	1-3

Other Studies Documenting Association with Plot Data
Oregon: Kovalchik 1987: 138 BLM E.S.I. 2002

Glyceria elata Association

Tall mannagrass Association

15 plots. CEGL000219. Note: CEGL001569 was named for the Fowl mannagrass (*Glyceria elata*) Association, while this type was originally named the *Glyceria striata* or Tall mannagrass Association. These two taxa have been synonymized as *Glyceria elata* and the two associations combined here. The tall mannagrass type is much more common, and represents most of the information.

Ecoregional Range

BM, EC, WC

Environment and Soils

Sites are gravel bars, stream banks, floodpains and springs. They are found in 16-500 feet wide, low to high gradient (2-10%), V- and trough-shaped valleys with moderately steep to steep side slopes. Adjacent stream reach types are B2, B3, B4 and C4, with stream widths from 1-15 feet wide. Woody debris effects from 10-30% of the active channel. Soils are Entisols (Mollic and Typic Endoaquents), Mollisols (Typic Endoaquolls), Inceptisols (Histic Humaquepts), and Histisol (Fluvaquentic Borohemist). Soils range from shallow to teep fine-texture material over water-worked gravel and cobbles, to peat deposits. Sites are generally flooded during spring runoff, but the water table drops to 20-50 cm below the soil surface by mid-summer at most sites.

Valley Environment	Average	Range
Elevation (ft)	5197	4140-7160
Plot Slope (%)	11	1-50
Valley Width (m)	27	5-65
Valley Gradient (%)	8	1-30
Valley Sideslopes (%)	47	15-70
Soil Surface Cover (%)		
Submerged	6	0-25
Bare Ground	9	0-50
Gravel	5	0-45
Rock	7	0-50
Cryptogam	36	0-85
Litter	40	0-93

Vegetation Composition

Mannagrass cover ranges from 10-70% over a rich mixture of graminoids and forbs including drooping woodreed, American mannagrass, common timothy Dewey's sedge, sword-leaf rush, yellow monkeyflower and enchanter's nightshade.

Adjacent Vegetation

Vegetation types sampled adjacent to this type include:

Terraces: grand fir/oakfern, grand fir/swordfern-wild ginger, grand fir/twinflower, lodgepole pine/Kentucky bluegrass,

Sideslopes: grand fir/Rocky Mountain maple, grand fir/big huckleberry, grand fir/grouse-huckleberry-twinflower, grand fir/Pacific yew/queen's cup beadlily, Douglas fir/common snowberry and other grand fir associations.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Prickly currant (*Ribes lacustre*)	53	7	2-15
Stinking swamp currant (*Ribes hudsonianum*)	47	5	1-15
SEDGES and RUSHES			
Dewey' s sedge (*Carex deweyana*)	40	10	1-50
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	100	36	10-90
PERENNIAL FORBS			
Yellow monkeyflower (*Mimulus guttatus*)	73	4	1-20
American speedwell (*Veronica americana*)	73	4	1-16
Enchanter' s nightshade (*Circaea alpina*)	67	8	1-20
Brook saxifrage (*Saxifraga odontoloma*)	60	11	3-25
Columbia monkshood (*Aconitum columbianum*)	60	8	1-37
Musk monkeyflower (*Mimulus moschatus*)	60	4	1-20

Other Studies Documenting Association with Plot Data

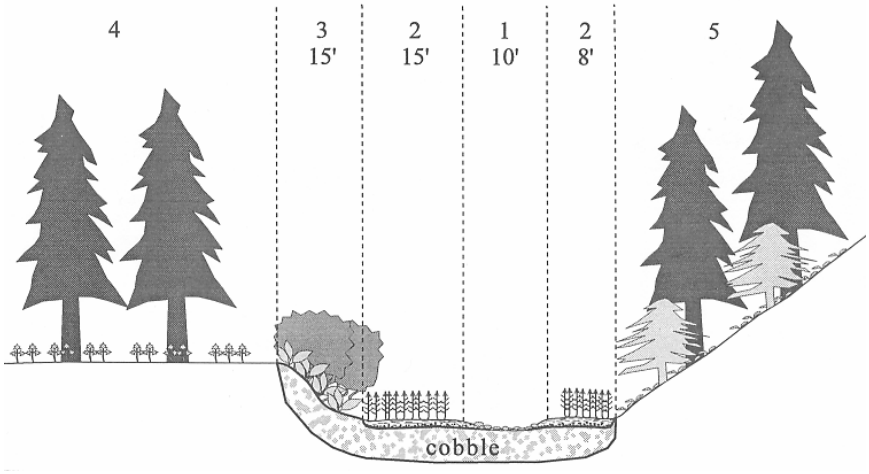
Oregon: Crowe and Clausnitzer 1997; Murray 2000 describes a *Glyceria elata (striata)*-*Caltha leptosepala* Association; Kauffman 1982: 59; Kauffman *et al.* 1985: 16
Washington: Kovalchik 2001
Nevada: Manning and Padgett 1995

Other Studies Documenting Association without Plot Data

Oregon: Titus and Christy 1996a, 1999; Strickler 1966: 30 (as *Glyceria striata*)

Illustrations

1.B3 stream reach
2.**Tall mannagrass**, alluvial bars
3.**Sitka alder/ladyfern**
4.**Grand fir/oakfern**, terrace
5.Grand fir/Pacific yew/queen's cup beadlily, northwest-facing sideslope



Touchet River, Pomeroy RD, Umatilla NF; moderate – low gradient, moderate elevation, V-shaped valley; Mesic Forest Zone, Blue Mountains Ecoregion.

Poa cusickii Association

Cusick' s bluegrass Association
6 Plots. CEGL001655

Ecoregional Range
BR, EC

Environment and Soils
The Cusick bluegrass association is located in the Pumice-mantled Basin & Range Physiographic Area. It is common on the Chiloquin and Chemult Districts (Winema National Forest) and extends eastward to the western fringe of the Fremont National Forest. Elevations are moderate (4200-6000 feet). Landforms supporting Cusick blue-grass meadows occur on the flat microrelief of dry basins and drainages and inactive floodplains and terraces.

Soils are pumice alluvium. Surface textures are silt loam to coarse sandy loam and grade into a gravelly pumice C horizon at 100 to 180 cm below the soil surface. Available water holding capacity is moderately low. The water table is within 60 cm of the soil surface in May and June and may flood the surface into July in abnormally wet years. Water tables lower to 130 to 150 cm below the soil surface by August but may be absent in drier years.

Valley Environment	Average	Range
Elevation (ft)	4677	4500-5200
Plot Slope (%)	0	0-2
Soil Characteristics		
Depth to Current Water Table (cm)	143	125-155
Soil Surface Cover (%)		
Bare Ground	11	0-20
Gravel	1	0-2
Cryptogam	9	0-35
Litter	79	43-95

Vegetation Composition
Cusick bluegrass is the dominant graminoid. Other graminoids include Oregon bentgrass, prairie junegrass, beardless wheatgrass, shortleaf muhly, and clustered field sedge. Common forbs include western yarrow, northwest cinquefoil, elk thistle, rosy pussytoes, and hoary aster. Kentucky bluegrass is uncommon except on moister portions of the association along the Williamson River. The absence of sagebrush distinguishes this from sagebrush/Cusick bluegrass associations.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Clustered field sedge (*Carex praegracilis*)	67	13	
Baltic rush (*Juncus balticus*)	67	2	
Nebraska sedge (*Carex nebrascensis*)	67	1	
PERENNIAL GRASSES			
Cusick' s bluegrass (*Poa cusickii*)	100	38	
Bearded wheatgrass (*Elymus caninus*)	83	7	
Prairie junegrass (*Koeleria macrantha*)	83	6	
Oregon bentgrass (*Agrostis oregonensis*)	67	4	
Western needlegrass (*Achnatherum occidentale*)	50	3	
PERENNIAL FORBS			
Yarrow (*Achillea millefolium*)	100	3	2-4
Hoary aster (*Aster canescens* var. *bloomeri*)	83	5	1-7
Elk thistle (*Cirsium foliosum*)	83	2	1-3
Dandelion (*Taraxacum officinale*)	83	1	--
Littleflower penstemon (*Penstemon procerus*)	67	3	2-3
Rosy pussytoes (*Antennaria rosea*)	67	3	2-3
Slender cinquefoil (*Potentilla gracilis*)	67	2	1-3
Long-stalk clover (*Trifolium longipes*)	67	2	1-3
ANNUAL and BIENNIAL FORBS			
Wingstem monkeyflower (*Mimulus alsinoides*)	67	1	1-2

Successional Dynamics

With overuse by livestock and other ungulates, Cusick bluegrass distribution becomes irregular and it becomes co-dominant with other graminoids and forbs. Beardless wheatgrass is rare. Perennial forbs occur as larger colonies or are common within the interspaces of Cusick bluegrass. The litter layer is somewhat discontinuous and compacted. Cusick bluegrass may be pedestalled and annual forbs are common in the bunchgrass interspaces, especially in moist years.

With continued overuse, Cusick bluegrass becomes subordinant to other grasses, sedges, and forbs. Prairie junegrass and beardless wheatgrass are rare while shortleaved muhly (*Muhlenbergia filiformis*), Baltic rush, perennial forbs, and clustered field sedge form large colonies. The litter layer is compacted and broken. Cusick bluegrass is pedestalled and the bunchgrass interspaces are dominated by perennial and annual forbs.

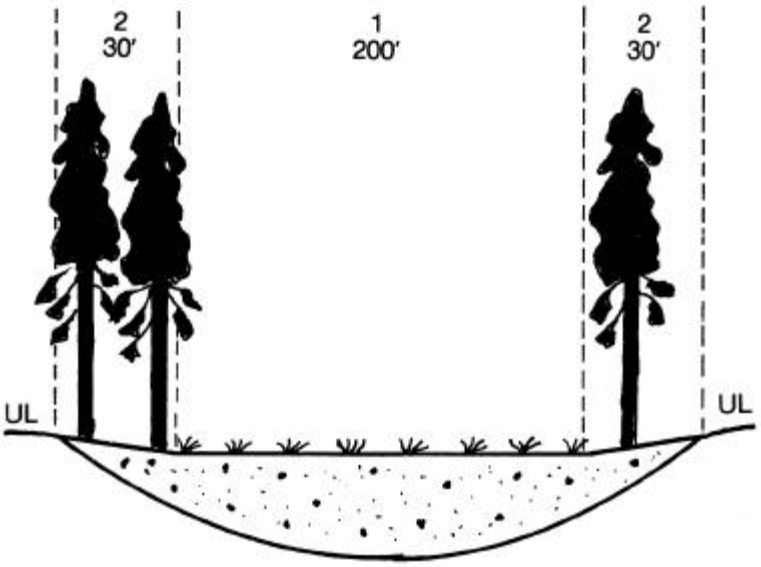
Other Studies Documenting Association with Plot Data

Oregon: Kovalchik 1987: 90; Volland (1976: 23) described a dry bluegrass meadow that is the same as this association; BLM E.S.I.
Nevada: Manning and Padgett 1995
California: Weixelman *et al.* 1999

Other Studies Documenting Association without Plot Data

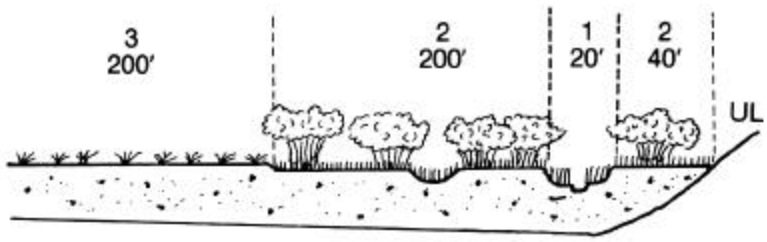
Oregon: Reid and Pickford 1946: 9; Stuth 1975: 71; Cornelius 1981: 3

Illustrations



1.**Cusick bluegrass**, dry meadow
2.**Lodgepole pine/bearberry**, transition slope

Unnamed meadow near Long Prairie; concave, mod elevation basin; Pumice-mantled Basin and Range Physiographic Area;Winema National Forest.



1 **Creeping spikerush**, new sediments between loose rock check dams
2 Willow/Kentucky bluegrass (**Booth willow-Geyer willow/woolly sedge** potential), inactive floodplain
3 **Cusick bluegrass**, inactive floodplain

Chocktoot Creek; low gradient, mod-low elevation floodplain; Basin and Range Physiographic Area; Fremont National Forest.

Leymus cinereus Association

Great Basin wildrye Association
4 plots. CEGL001479

Ecoregional Range
BR, BM, CB, EC

Environment and Soils
This association is commonly found in swales and at the base of alluvial fans and toeslopes in drier climates. Great Basin wildrye (Leymus cinereus) is somewhat tolerant of high soil sodium content and high alkalinity. Soils are generally deep and fine-textured and have moderate water holding capacity. Sites are moist to wet in the spring and moist to dry by mid summer.

Valley Environment	Average	Range
Elevation (ft)	3210	1940-4620
Plot Slope (%)	4	1-10
Soil Surface Cover (%)		
Bare Ground	2	0-8
Rock	1	0-1
Cryptogam	tr	0-1
Litter	90	82-98

Vegetation Composition
Great Basin wildrye dominants the site. Other herbaceous species and occasionally shrubs are present at low cover. Plots sampled tended to be weedy due to high grazing pressure on these sites. All of the species with the highest constancy are introduced European species.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
PERENNIAL GRASSES			
Great Basin wildrye (*Leymus cinereus*)	100	59	40-95
Kentucky bluegrass (*Poa pratensis*)	40	6	2-10
PERENNIAL FORBS			
Teasel (*Dipsacus fullonum*)	40	3	1-5
Tall tumblemustard (*Sisymbrium altissimum*)	40	2	1-3
St. John' s wort (*Hypericum perfoliatum*)	40	1	--
Yarrow (*Achillea millefolium*)	40	1	--
ANNUAL and BIENNIAL FORBS			
Cleavers (*Galium aparine*)	60	11	1-30
Miners lettuce (*Claytonia perfoliata* ssp. *perfoliata*)	60	2	1-5
Thistles (*Cirsium* spp.)	40	1	--
Prickly lettuce (*Lactuca serriola)*	40	1	--

Adjacent Vegetation
Upland associations adjacent to sites sampled are Bluebunch wheatgrass (*Pseudoroegneria spicata*), Idaho fescue (*Festuca idahoensis*), Western juniper (*Juniperus occidentalis*) associations.

Other Studies Documenting Association with Plot Data
Oregon: BLM E.S.I. ; NRCS Loamy Bottom (010XY005OR) 1990, Mountain Loamy Bottom (010XY006OR) 1990, Sandy Bottom (010XY121OR) 1999, Clayey Bottom (010XY014OR) 1990 all in Upper Snake River Lava Plains and Hills: these Ecological Sites are very close or similar to this association; NRCS Loamy Bottom Ecological Site (010XY005OR-Harney County)

FORB ASSOCIATIONS

Adiantum pedatum Association

Maidenhair fern Association
2 plots. New type

Valley Environment	Average	Range
Elevation (ft)	3840	2640-5040
Plot Slope (%)	24	12-35
Valley Width (m)	5	--
Valley Gradient (%)	10	--
Valley Sideslopes (%)	43	15-70
Soil Characteristics		
Depth to 80% Coarse Fragments	7	0-13
Soil Surface Cover (%)		
Submerged	3	0-5
Rock	tr	0-1
Cryptogam	37	5-68
Litter	61	27-94

Ecoregional Range
BM, WC

Environment and Soils
Although only two sites were sampled in this association (one of which was in the northern Blue Mountains), it is well established locally in the Strawberry Mountains, and Diaz and Mellon describe a similar maidenhair fern association as widely occurring in the West Cascades. Plots were sampled on streambanks along West Fork Little Indian Creek and on a tributary to North Fork Umatilla River. It is abundant on tributaries to Indian Creek in the Strawberry Mountains Wilderness. Valleys in which these streams occur are narrow, V-shaped and high gradient with Rosgen A and B types with cobble or gravel substrates. The streambanks are flooded during spring runoff and the water table is probably fairly close to the soil surface throughout the growing season. Soils are very cobble/gravel rich and were wet close to the surface at the time of sampling and the sites receive spray from the streams through most of the summer. The environmental setting for this association most closely resembles Diaz and Mellon's (1996) Rocky Slope Ecotype.

Vegetation Composition
Maidenhair fern and occasionally ladyfern form the dominant herbaceous canopy. Blue wildrye was dominant on one plot, but this is generally not true of This association. Forbs species are sparse in the herbaceous understory. Average height of herbaceous vegetation was 75 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Prickly currant (*Ribes lacustre*)	100	2	1-3
SEDGES and RUSHES			
Dewey' s sedge (*Carex deweyana*)	50	4	--
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucous*)	50	60	--
Tufted hairgrass (*Deschampsia caespitosa)*	50	5	--
PERENNIAL FORBS			
Hairy willow-herb (*Epilobium ciliatum*)	100	2	1-3
Heartleaf bittercress (*Cardamine cordifolia*)	50	15	--
Wild ginger (*Asarum caudatum*)	50	7	--
FERNS and HORSETAILS			
Maidenhair fern (*Adiantum pedatum*)	100	28	25-30
Ladyfern (*Athyrium filix-femina*)	50	25	--

Adjacent Vegetation
Upland associations adjacent to sites sampled were mesic Grand fir (*Abies grandis*) associations.

Other Studies Documenting Association with Plot Data
Oregon and Washington: Diaz and Mellon 1996

Allium validum Association

Swamp Onion Association
15 plots. New type

Valley Environment	Average	Range
Elevation (ft)	7126	6200-7620
Plot Slope (%)	6	1-30
Valley Width (m)	88	5-200
Valley Gradient (%)	6	2-18
Valley Sideslopes (%)	43	15-70
Soil Characteristics		
Rooting Depth	27	15-40
Depth to Redoximorphic Features	33	10-60
Depth to 80% Coarse Fragments	43	21-65
Soil Surface Cover (%)		
Submerged	1	0-4
Bare Ground	7	0-20
Gravel	tr	0-2
Rock	1	0-3
Cryptogam	59	15-90
Litter	25	5-70

Ecoregional Range
BM, EC

Environment and Soils
This association is common at high elevations in the Wallowa, Elkhorn and Strawberry Mountains in the Blue Mountain Ecoregion. Only one sample plot was located in the East Cascades Ecoregion. The association occurs on springs and at somewhat drier locations in wet meadow complexes, such as along meadow edges or or slightly raised hummocks. Sites sampled were flat to slightly concave or undulating. Valleys in which this association occurs are moderately wide to wide and U or trough shaped. Most soils were silt loams or organic-rich loams. A couple of sites had organic soils. Soils are richer in coarse fragments than the Swamp onion-Carex scopulorum (*Allium validum-Carex scopulorum*) Association (which had coarse fragments in only one soil profile) and much more than the Holm' s sedge (*Carex scopulorum*) Association.

Vegetation Composition
Swamp onion is quite abundant on sites with an herbaceous understory of various short-statured forbs. Moss cover of the soil surface is high, indicating that the sites are generally not saturated for long during the growing season. Average height of herbaceous vegetation is 36 cm, ranging from 15 to 60 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Holm' s sedge (*Carex scopulorum*)	73	8	1-60
Few-flowered spikerush (*Eleocharis quinqueflora*)	40	3	1-5
Drummond' s rush (*Juncus drummondii*)	40	1	--
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa)*	60	17	1-60
PERENNIAL FORBS			
Swamp onion (*Allium validum*)	100	65	30-100
Subalpine daisy (*Erigeron peregrinus* ssp. *callianthemus*)	60	11	1-50
High mountain cinqufoil (*Potentilla flabellifolia*)	60	10	1-40
Elephant' s head (*Pedicularis groenlandica*)	60	1	1-2
Alpine shooting star (*Dodecatheon alpinum*)	53	5	1-20
Idaho licoriceroot (*Ligusticum tenuifolium*)	53	1	1-2
Alpine meadow butterweed (*Packera cymbalarioides*)	47	11	1-50
Mountain buttercup (*Ranunculus populago*)	40	7	1-40

Adjacent Vegetation
The *Allium validum* Association is generally found in a complex of other meadow or spring associations such as Holm' s sedge (*Carex scopulorum*) and Few-flowered spikerush (*Eleocharis quinqueflora)*. Adjacent upland vegetation comprised Subalpine fir/Dwarf huckleberry (*Abies lasiocarpa/Vaccinium scopulorum*) associations.

Successional Dynamics

These sites are sometimes moderately to heavily grazed by elk. In those instances, the total cover of herbaceous species other than Allium validum tends to increase as well as the cover of bare soil. If soil moisture increases on these sites with long-term changes in total precipitation (most of which would be contained in the yearly snowpack) or with increases in groundwater contributions, the site may transition to the Swamp onion-Holm' s sedge (*Allium validum-Carex scopulorum*) Association and ultimately to the Holm' s sedge (*Carex scopulorum*) Association. If the site becomes drier, it may transition to the Black alpine sedge-Holm' s sedge-tufted hairgrass (*Carex nigricans/Carex scopulorum/Deschampsia caespitosa*) Association.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997: 213; Titus 1998b

Other Studies Documenting Association without Plot Data

Oregon: Cole 1977: 103; Cole 1982: 22

Allium validum-Carex scopulorum Association

Swamp onion-Holm' s sedge Association
6 plots. New type

Ecoregional Range
BM

Environment and Soils
All plots sampled in this association occurred in moist to wet sites in wet meadow complexes. Sites were flat to slightly concave on the surface. Valleys in which this association occurs are moderately wide to wide and U or trough shaped. Surface horizons of soils were either organic-rich loams or silt loams or peats (fibric or hemic histosols). These soils are more organic-rich than those of the Swamp onion Association. Coarse fragments were only found in one soil profile.

Valley Environment	Average	Range
Elevation (ft)	7228	6380-7800
Plot Slope (%)	3	1-10
Valley Width (m)	133	65-200
Valley Gradient (%)	2	--
Valley Sideslopes (%)	36	15-70
Soil Characteristics		
Rooting Depth	38	30-51
Depth to Redoximorphic Features	31	16-43
Soil Surface Cover (%)		
Submerged	1	0-5
Bare Ground	6	0-20
Rock	1	0-4
Cryptogam	37	0-90
Litter	51	3-95

Vegetation Composition
Swamp onion and Holm' s sedge are co-dominant on sites and comprise the majority of the herbaceous vegetation on the sites. Average herbaceous vegetation height is 46 cm, ranging from 30 to 60 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Holm' s sedge (*Carex scopulorum*)	100	33	15-40
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa)*	50	7	5-10
PERENNIAL FORBS			
Swamp onion (*Allium validum*)	100	60	20-80
Alpine meadow butterweed (*Packera cymbalarioides*)	83	2	1-5
American bistort (*Polygonum bistortoides*)	50	9	2-15
High mountain cinquefoil (*Potentilla flabellifolia*)	50	7	1-20
Violets (*Viola* spp.)	50	5	5-5
Gray' s licoriceroot (*Ligusticum grayi*)	50	3	1-5
Explorer' s gentian (*Gentiana calycosa*)	50	2	1-3
Meadow arnica (*Arnica chamissonis*)	50	1	--

Adjacent Vegetation
The *Allium validum/Carex scopulorum* Association is generally found in a complex of other meadow or spring associations such as Holm' s sedge and Few-flowered spikerush (*Eleocharis quinqueflora).* Adjacent upland vegetation comprised Subalpine fir/Dwarf huckleberry (*Abies lasiocarpa/Vaccinium scopulorum*) associations.

Successional Dynamics
Since this association has soil moisture characteristics midway between the Swamp onion Association and the Holm' s sedge Association, if the soils become drier or wetter with changes in groundwater hydrology, the sites will probably transition to one or the other association. Excessive disturbance of the soil surface by grazing or burrowing animals will favor the increase of herbaceous species cover.

Other Studies Documenting Association without Plot Data
Oregon: Cole 1977: 103; Cole 1982: 22.

Athyrium filix-femina Association

Ladyfern Association
4 plots, New type

Valley Environment	Average	Range
Elevation (ft)	5508	2860-7120
Plot Slope (%)	13	1-25
Valley Width (m)	110	20-200
Valley Gradient (%)	12	2-25
Valley Sideslopes (%)	30	15-45
Soil Surface Cover (%)		
Submerged	29	7-50
Bare Ground	1	0-5
Gravel	3	0-10
Rock	24	0-50
Cryptogam	36	5-89
Litter	19	0-70

Ecoregional Range
BM, EC, WC

Environment and Soils
This association is found in north-facing valleys with a range of widths and gradients. Most sites were very steep, narrow, V and trough-shaped valleys. Sites are streambanks, channel shelves and one spring. Surface soils are silt loams and sandy loams with high percentages of stones and boulders. Soils are wet to saturated for much of the growing season.

Vegetation Composition
The herbaceous canopy is dominated by ladyfern, which produces a dense layer of fronds. Tall mannagrass is abundant in wet, fine-textured microsites. Average herbaceous vegetation height is about 1 m.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Dewey' s sedge (*Carex deweyana*)	50	6	2-10
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	75	11	2-25
Drooping woodreed (*Cinna latifolia)*	75	3	1-6
Blue wildrye (*Elymus glaucous*)	75	2	2-3
PERENNIAL FORBS			
Arrowleaf groundsel (*Senecio triangularis*)	75	13	7-25
Sweet-scented bedstraw (*Galium triflorum*)	75	4	3-5
Alpine mitrewort (*Mitella pentandra*)	75	4	1-5
Yellow monkeyflower (*Mimulus guttatus*)	50	4	2-5
Heartleaf bittercress (*Cardamine cordifolia*)	50	3	1-5
Red columbine (*Aquilegia formosa*)	50	3	2-3
FERNS and HORSETAILS			
Ladyfern (Athyrium filix-femina)	100	58	25-85

Adjacent Vegetation
Adjacent upland vegetation comprised Grand fir (*Abies grandis*) associations.

Other Studies Documenting Association with Plot Data
Washington: Kovalchik 2001
Alaska: Boggs 2000

Artemisia ludoviciana Association

Prairie sage Association
3 plots. New type

Ecoregional Range
BM

Environment and Soils
Valleys in which this association occurs are narrow, trough-shaped and high gradient. Sites are coarse-textured, well-drained streambanks, levees, sandy-gravelly bottoms of ephemeral or intermittently moist streams and overflow channels. Most sites are frequently and strongly affected by erosion and deposition of sediments from in stream or overbank flood flows. Stream channels adjacent to sites sampled were Rosgen A4 and D3 types. Soils are sandy-skeletal (having a high percentage of coarse fragments). Most sites were too rocky to dig and describe soil profiles. Soil temperature was measured on only one site at 10cm depth and was 31 deg. C (84 deg F). Thus, sites are very warm compared to the surrounding soils at these high elevations. This probably explains the low species cover of most of the associated species on the site.

Valley Environment	Average	Range
Elevation (ft)	6230	5560-6900
Plot Slope (%)	23	20-25
Valley Width (m)	20	--
Valley Gradient (%)	10	--
Valley Sideslopes (%)	15	--
Soil Surface Cover (%)		
Bare Ground	3	0-5
Gravel	1	0-2
Rock	60	40-80
Cryptogam	5	0-10
Litter	59	38-60

Vegetation Composition
Prairie sage is clearly dominant in the herbaceous vegetation with cover from 40-80%. Other species are scattered through the sites at low cover. Average herbaceous vegetation height is 44 cm, ranging from 30 to 57 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Creeping spikerush (*Eleocharis palustris*)	33	10	--
Hood' s sedge (*Carex hoodii*)	33	5	--
PERENNIAL FORBS			
Prairie sage (*Artemisia ludoviciana*)	100	55	40-80
Western coneflower (*Rudbeckia occidentalis*)	67	13	5-20
Asters (*Aster* spp.)	67	2	1-3
Yarrow (*Achillea millefolium*)	67	1	--
Western larkspur (*Delphinium occidentale*)	33	5	--
Povertyweed (*Iva axillaris*)	33	3	--

Adjacent Vegetation
Upland vegetation adjacent to sites sampled was *Carex hoodii* meadow and *Abies grandis* forest.

Successional Dynamics
Due to the frequent and high energy disturbance on these sites, succession is unlikely to occur. It sites change with diversion of stream channels, organic matter and fine soil materials may slowly build up and convert the potential of the site to another plant association.

Other Studies Documenting Association with Plot Data
Washington: Crawford 2000
Idaho: Jankovsky-Jones *et al.* 2001; Lichthardt 1992

Camassia cusickii Association

Cusick' s camas Association
8 plots. CEGL003440

Ecoregional Range
BM

Environment and Soils
This association is endemic to the southern end of Hells Canyon. It occurs in portions of the Imnaha River and Pine Creek drainages and in Hells Canyon along the main Snake River. The association occurs on seepy, colluvial sites beneath basalt rims. Sites are wet into early summer. The soils are highly oxidized basalt parent material and are shallow (average depth is 100 cm) to bedrock with clay to clay loam surface horizons (Johnson and Simon 1987).

Valley Environment	Average	Range
Elevation (ft)	5053	3420-5960
Plot Slope (%)	39	15-60
Soil Surface Cover (%)		
Bare Ground	8	1-20
Gravel	10	3-20
Rock	38	10-70
Bedrock	2	0-15
Cryptogam	6	0-15
Litter	17	1-65

Vegetation Composition
The Cusick' s camas Association is heavily dominated by the cover of *Camassia cusickii*. The remainder of the vegetation generally constitutes little cover on the site with the exception of bluebunch wheatgrass, which can have as much as 25% cover. Average height of herbaceous vegetation is approximately 60 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
PERENNIAL GRASSES			
Bluebunch wheatgrass (*Pseudoroegneria spicata*)	75	11	1-25
Sandberg' s bluegrass (*Poa secunda* ssp *sandbergii*)	50	3	1-5
PERENNIAL FORBS			
Cusick' s camas (*Camassia cusickii*)	100	45	20-60
Spearleaf stonecrop (*Sedum lanceolatum*)	63	4	1-10
White mariposa lily (*Calochotus eurycarpus*)	50	4	1-10
Woolly groundsel (*Senecio integerrimus*)	50	3	1-10
Oregon checkermallow (*Sidalcea oregana*)	50	2	1-3
ANNUAL and BIENNIAL FORBS			
Douglas' knotweed (*Polygonum douglasii*)	88	10	1-25

Adjacent Vegetation
This association occurs within a matrix of bunchgrass-dominated communities on canyon slopes. The dominant bunchgrass is usually bluebunch wheatgrass (*Pseudoroegneria spicata*) (Johnson and Simon 1987).

Successional Dynamics
Degraded Camassia cusickii sites contain a greater abundance of Yarrow (*Achillea millefolium*), Douglas' knotweed (*Polygonum douglasii*), rush pussytoes (*Antennaria luzuloides*) and fernleaf biscuitroot (*Lomatium dissectum*) (Johnson and Simon 1987).

Other Studies Documenting Association with Plot Data
Oregon: Johnson and Simon 1987
Idaho: Jankovsky-Jones *et al.* 2001

Equisetum arvense Association

Common horsetail Association
8 plots. CEGL003314

Ecoregional Range

BM, CR, EC, WC, WV. This association is on the Heritage plant association list for Washington.

Valley Environment	Average	Range
Elevation (ft)	4693	3820-6340
Plot Slope (%)	3	0-7
Valley Width (m)	59	20-65
Valley Gradient (%)	2	1-5
Valley Sideslopes (%)	24	15-45
Soil Characteristics		
Depth to 80% Coarse Fragments	11	0-53
Soil Surface Cover (%)		
Submerged	27	0-80
Bare Ground	12	0-70
Gravel	13	0-90
Rock	31	0-100
Cryptogam	18	0-86
Litter	4	0-15

Environment and Soils

Sample locations for this association were in the Wallowa Mountains, the central Blue Mountains (north and south of John Day) and in the East Cascades. All sites are cobbly and/or gravelly alluvial bars or incipient floodplains adjacent to Rosgen B2, B3, B4 or C4, 5-30 ft. wide streams. Soils are sandy-skeletal (highly coarse-fragment rich) and undeveloped (Entisols). The sites are flooded during spring runoff, and the water table remains within 30 cm of the soil surface. This plant association is found on stream orders 1,2 and 3.

Vegetation Composition

Common horsetail cover ranges from 10-75%. Other forbs and graminoids are scattered amonst the horsetail, usually at low cover. Field mint, curly dock (*Rumex crispus*), spike bentgrass (*Agrostis exarata*) and *Yellow monkeyflower* (*Mimulus guttatus*) are occasionally abundant. Average herbaceous vegetation height is 34 cm, ranging from 10 to 79 cm. A number of woody plants occur in this association with low constancy and cover, including Mountain alder (*Alnus incana*), red-osier dogwood (*Cornus sericea*), stinking swamp currant (*Ribes hudsonianum*), Prickly currant (*Ribes lacustre*), Engelmann spruce (*Picea engelmannii*) and Lodgepole pine (*Pinus contorta*).

Adjacent Vegetation

Adjacent upland vegetation ranges from Ponderosa pine types to Subalpine fir associations as well as colder Grand fir associations (e.g. *Abies grandis/ Vaccinium scoparium-Linnaea borealis*).

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SEDGES and RUSHES			
Lenticular sedge (*Carex lenticularis*)	50	3	1-8
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	75	6	2-11
PERENNIAL FORBS			
Yellow monkeyflower (*Mimulus guttatus*)	63	6	1-15
Hairy willow-herb (*Epilobium ciliatum*)	63	2	1-4
Field mint (*Mentha arvensis*)	50	22	2-40
FERNS and HORSETAILS			
Common horsetail (Equisetum arvense)	100	50	10-75

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997: 210; Diaz and Mellon 1997: 159; Murray 2000
Washington: Titus *et al.* 1997
Alaska: Boggs 2000

Other Studies Documenting Association without Plot Data

Oregon: Seyer 1983

Senecio trianglaris-Mixed Subalpine Forb Association

Arrowleaf groundsel – mixed subalpine forb Association
8 plots. CEGL001987

Ecoregional Range
BM

Valley Environment	Average	Range
Elevation (ft)	6761	5520-7340
Plot Slope (%)	8	1-20
Valley Width (m)	33	5-65
Valley Gradient (%)	7	2-10
Valley Sideslopes (%)	31	15-70
Soil Surface Cover (%)		
Submerged	15	0-50
Bare Ground	5	0-15
Gravel	3	0-22
Rock	9	0-37
Cryptogam	27	0-85
Litter	23	0-95

Environment and Soils
This association occurs in narrow to moderately wide U and trough-shaped valleys with moderately high to high gradients in the Wallowa and Strawberry Mountains Sites are alluvial bars, floodplains and occasionally the edges of meadows. Associated Rosgen stream types are A4 and D3. Soils are rocky (most could not be dug into and described) and wet throughout the growing season. This association is unshaded and receives much more sunlight than the Ladyfern and Arrowleaf groundsel Associations which can have other similar site characteristics. Sites are probably established by periodic, stochastic, depositional events.

Vegetation Composition
A mix of herbaceous forbs and occasionally wet site-loving grasses make up the vegetation cover on the site. Sites vary as to the combination of dominant forbs, which is probably determined, in part, by which species' seeds arrived at the site first. Although arrowleaf groundsel has high constancy and abundant cover in most plots sampled, one or more of the following tall forbs is equally or more abundant: common cowparsnip, western larkspur, Lewis' monkeyflower, subalpine daisy, tall and broadleaf bluebells, western polemonium or California false hellebore. This species composition contrasts strongly with the Arrowleaf groundsel Association. Average herbaceous vegetation height is 71 cm, ranging from 50 to 84 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
PERENNIAL GRASSES			
Drooping woodreed (*Cinna latifolia)*	50	3	1-9
Tall mannagrass (*Glyceria striata*)	38	4	1-11
Blue wildrye (*Elymus glaucous*)	25	30	1-60
PERENNIAL FORBS			
Arrowleaf groundsel (*Senecio triangularis*)	88	30	2-60
Lewis' monkeyflower (*Mimulus lewisii*)	63	18	2-60
Common cowparsnip (*Heracleum maximum*)	50	34	15-60
Brook saxifrage (*Saxifraga odontoloma*)	50	30	20-40
Western larkspur (*Delphinium occidentale*)	50	15	1-20
Asters (*Aster* spp.)	50	4	1-6
Stinging nettle (*Urtica dioica*)	50	3	1-10
Subalpine daisy (*Erigeron peregrinus* ssp. *callianthemus*)	25	50	40-60
Clovers (*Trifolium* spp.)	25	30	5-55
Tall bluebells (*Mertensia paniculata*)	13	50	--
Hairy willow-herb (*Epilobium ciliatum*)	13	25	--
California false hellebore (*Veratrum californicum*)	13	25	--
Western polemonium (*Polemonium occidentale*)	13	15	--
Broadleaf bluebells (*Mertensia ciliata*)	13	10	--

Adjacent Vegetation
Upland vegetation adjacent to sites sampled includes Grand fir and Subalpine fir associations.

Successional Dynamics

This association may succeed to Sitka alder (*Alnus sinuata*)/Mesic forb Association if the site remains stable for a long enough period of time. Some sample sites in the Strawberry Mountains were located in watersheds that had been severly burned 2 years prior to sampling. All upland trees were killed in the fire and the sideslopes were still depauperate. These sites were heavily shaded by subalpine fir forests prior to the fire, and once the forests regrow and shade the sites again, this association will undoubtedly succeed to another association.

Other Studies Documenting Association

None

Saxifraga odontoloma Association

Brook saxifrage Association
4 plots. CEGL001985

Valley Environment	Average	Range
Elevation (ft)	6260	5700-6530
Plot Slope (%)	15	10-20
Valley Gradient (%)	10	--
Soil Characteristics		
Rooting Depth (cm)	13	10-15
Depth to 80% Coarse Fragments	15	10-21
Soil Surface Cover (%)		
Submerged	13	3-25
Bare Ground	tr	0-1
Gravel	tr	0-1
Rock	1	0-2
Cryptogam	61	15-97
Litter	29	0-74

Ecoregional Range

BM, EC, WC

Environment and Soils

Two of the sites sampled were springs and two were along the banks of narrow, high gradient Rosgen A streams. All sites are heavily shaded and are very wet throughout the growing season, and soils are either organic oozes (sapric histosols) or have organic rich loam or silt loam surface horizons over cobbly subsoils. Essentially the rooting zone (note that the average rooting depth is ver y shallow at 13 cm) is saturated. These sites are less frequently disturbed by erosion, sedimentation and flooding than the Arrowleaf groundsel (*Senecio triangularis*) Association.

Vegetation Composition

Brook saxifrage is abundant with various wet site forbs and graminoids scattered through the sites at low cover, including alpine mitrewort, hairy willow-herb, arrowleaf groundsel, stream buttercup (*Ranunculus uncinatus*), tall mannagrass, slender muhly (*Muhlenbergia filiformis*), Swordleaf rush (*Juncus ensifolius*) and Small-flowered woodrush (*Luzula parviflora*). Average herbaceous vegetation height is 19cm, ranging from 15 to 23 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Prickly currant (*Ribes lacustre*)	100	2	1-5
SEDGES and RUSHES			
Small-flowered woodrush (*Luzula parviflora*)	50	2	1-3
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	50	13	6-20
PERENNIAL FORBS			
Brook saxifrage (*Saxifraga odontoloma*)	100	33	15-65
Alpine mitrewort (*Mitella pentandra*)	75	9	1-20
Hairy willow-herb (*Epilobium ciliatum*)	75	4	1-6
Arrowleaf groundsel (*Senecio triangularis*)	75	2	1-3
Yellow monkeyflower (*Mimulus guttatus*)	75	2	1-5
Columbia monkshood (*Aconitum columbianum*)	50	10	1-20
Large-leaf avens (*Geum macrophyllum*)	50	3	1-5

Adjacent Vegetation

Upland vegetation adjacent to sites sampled includes White fir (*Abies concolor*) and, predominantly Subalpine fir (*Abies lasiocarpa*) associations.

Successional Dynamics

If the soils on these sites become drier, the adjacent upland fir (*Abies*) association(s) may become dominant on the site.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997: 213; Diaz and Mellon 1997: 183 described a *Saxifraga arguta (odonotoloma) -Senecio triangularis* Association that is similar to this and to the *Senecio triangularis* Association.

Washington: Kovalchik 2001 described a *Saxifraga pumila* Association that is similar to the *Saxifraga odontoloma* Association.

Senecio triangularis Association

Arrowleaf groundsel Association

17 plots. CEGL001987

Ecoregional Range

BM, BR, EC, WC

Valley Environment	Average	Range
Elevation (ft)	5801	4700-7930
Plot Slope (%)	13	0-60
Valley Width (m)	20	5-65
Valley Gradient (%)	14	1-50
Valley Sideslopes (%)	33	15-45
Soil Surface Cover (%)		
Submerged	6	0-15
Bare Ground	9	0-50
Gravel	3	0-7
Rock	6	0-37
Bedrock	1	0-5
Cryptogam	41	4-70
Litter	42	0-85

Environment and Soils

This association occurs at mid to high elevations in the Cascade, Wallowa, Elkhorn, Strawberry and northen Blue Moutains. Sites are mostly narrow banks or channel shelves of first order streams incised into moderate to steeply graded V-shaped valley landforms. The riparian zone is usually just a few meters wide and limits the variety of plant associations present in the landform. The microclimate is cold and humid. Two of the sample sites were springs. Occasionally this plant association is seen on a broad, rocky alluvial deposition found where an abrupt valley slope change occurs along a stream. Streams are perennially flowing or nearly so. Soils are cold and well-aerated and are composed of a mix of colluvium and alluvium and often contain a significant portion os stone and cobbles. Textures ranges from stony sandy loam to loam. Water tabkes are near the soil surface as streamflows increase during spring runoff and summer thunderstorms. Water tables are within 60 cm of the soils surface much of the summer.

Vegetation Composition

The arrowleaf groundsel association is identified by a rich, mesic composition of herbs, especially forbs. The most characteristic and generally the most dominant species is arrowleaf groundsel. Graminoids are subordinate to forbs and include Merten' s rush, tall mannagrass (*Glyceria striata*), drooping woodreed (*Cinna latifolia*), soodrush sedge (*Carex luzulina*), Drummond' s rush (*Juncus drummondii*) and field woodrush (*Luzula campestris*). The banks are often shaded by conifers except in alpine settings. Low shrubs such as prickly currant, grouse huckleberry and big huckleberry (*Vaccinium membranaceum*) increase in cover with removal of conifers from adjacent slopes. Average height of herbaceous vegetation is 51 cm, ranging from 8 to 91 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
UNDERSTORY TREES			
Mountain hemlock (*Tsuga mertensiana*)	59	3	1-10
Subalpine fir (*Abies lasiocarpa*)	47	3	1-4
SHRUBS			
Prickly currant (*Ribes lacustre*)	59	5	1-15
Grouse huckleberry (*Vaccinium scoparium*)	59	4	1-15
SEDGES and RUSHES			
Merten' s rush (*Juncus mertensianus*)	47	1	1-2
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	43	3	1-10
PERENNIAL FORBS			
Arrowleaf groundsel (*Senecio triangularis*)	100	29	5-85
Alpine mitrewort (*Mitella pentandra*)	88	3	1-5
Columbia monkshood (*Aconitum columbianum*)	65	5	1-15
Gray' s licoriceroot (*Ligusticum grayi*)	53	4	1-15
Long-stalk clover (*Trifolium longipes*)	47	10	1-35
Yellow monkeyflower (*Mimulus guttatus*)	47	6	1-37
Wormskjold speedwell (*Veronica wormskjoldii*)	47	3	1-15
Sidebells pyrola (*Orthilia secunda*)	47	2	1-5
Slender bog-orchid (*Platanthera stricta*)	47	1	1-5

Adjacent Vegetation

Upland vegetation adjacent to sites sampled includes Grand fir (*Abies grandis*), White fir (*Abies concolor*) and Subalpine fir (*Abies lasiocarpa*) associations.

Other Studies Documenting Association with Plot Data

Oregon: Kovalchik 1987: 124; Hemstrom *et al.* 1987: 251; Crowe and Clausnitzer 1997: 212; Diaz and Mellon 1997: 191 described a *Saxifraga odontoloma-Senecio triangularis* Association that is similar to this and to the *Senecio triangularis* Association; Murray 2000.

Nevada: Manning and Padgett (1995) describe a Bigleaf lupine-Arrowleaf groundsel (*Lupinus polyphyllus-Senecio triangularis*) community type that includes plots similar to the Arrowleaf groundsel Association.

Montana: Hansen *et al.* 1995

Other Studies Documenting Association without Plot Data

Oregon: Hickman 1976: 150

Veratrum californicum Association

California false hellebore Association
12 plots. CEGL001946

Ecoregional Range
BM, BR, EC

Valley Environment	Average	Range
Elevation (ft)	6097	4300-7880
Plot Slope (%)	8	1-30
Valley Width (m)	178	65-350
Valley Gradient (%)	9	2-30
Valley Sideslopes (%)	19	15-45
Soil Characteristics		
Depth to Current Water Table	51	15-77
Soil Surface Cover (%)		
Bare Ground	42	0-90
Gravel	3	0-15
Rock	2	0-15
Cryptogam	3	0-15
Litter	41	5-95

Environment and Soils
This association occurs on springs, slumps, floodplains and in moist meadows at high elevations or at mid elevations in cold air drainages. Valleys are U and trough-shaped and generally north-facing. Where streams were associated with sites sampled, they were Rosgen E4, E6 and F5 types. Most soils are cold, moist and have thick, dark, organic-rich surface horizons (Mollic Epipedons) with textures ranging from silt loam to sandy loam. A few sites had soils with high coarse fragment contents. Water tables generally remain within 50 to 70 cm of the soil surface throughout the growing season.

Vegetation Composition
Bare ground or litter occupy much of the ground surface in this association. Most associated forb and graminoid speces occur at low cover. Average height of herbaceous vegetation is approximately 130 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	75	5	tr-15
Meadow barley (*Hordeum brachyantherum*)	50	5	1-15
PERENNIAL FORBS			
California false hellebore (*Veratrum californicum*)	100	53	20-85
Yellow monkeyflower (*Mimulus guttatus*)	50	3	tr-15
Dandelion (*Taraxacum officinale*)	50	1	tr-15
American bistort (*Polygonum bistortoides*)	42	4	tr-15
Oregon checkermallow (*Sidalcea oregana*)	42	2	tr-10
Hairy willow-herb (*Epilobium ciliatum*)	42	2	1-5
Large-leaf avens (*Geum macrophyllum*)	42	tr	0-1

Adjacent Vegetation
Upland vegetation adjacent to sites sampled ranged from Big sagebrush to Grand fir, White fir and Subalpine fir associations.

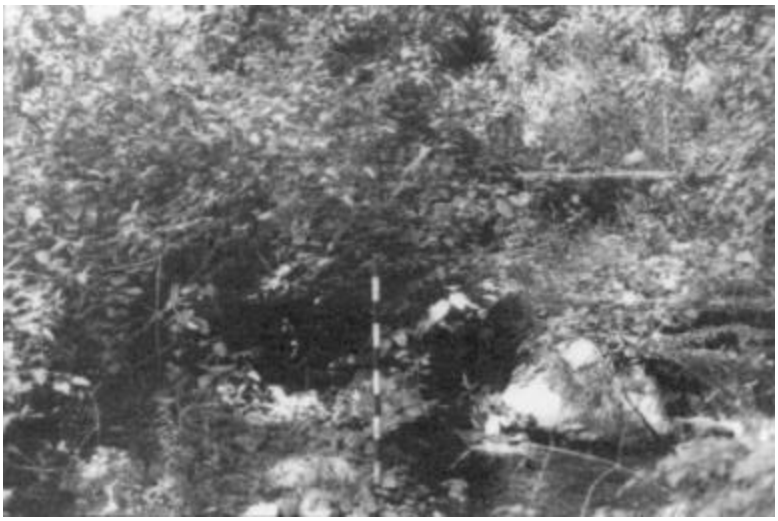
Successional Dynamics
This association with its characteristic high canopy cover of California false hellebore indicates that heavy grazing has occurred on the site presently or in the past. Once well established on a site, hellebore seems to persist for very long periods of time. Speculation as to the original associations occurring on these sites has ranged from Broadleaf bluebells (*Mertensia ciliata*) (Manning and Padgett 1995) to Tufted hairgrass (*Deschampsia caespitosa)* (Crowe and Clausnitzer 1997) to Quaking aspen/blue wildrye (*Populus tremuloides/Elymus glaucous*), Blue wildrye, and Bluejoint reedgrass (*Calamagrostis canadensis*) (Kovalchik 1987).

Other Studies Documenting Association with Plot Data
Oregon: Hemstrom *et al.* 1987: 251; Kovalchik 1987: 124; Crowe and Clausnitzer 1997: 201; Murray 2000 described a *Veratrum californicum-Carex angustata-Solidago canadensis* Association.
Nevada: Manning and Padgett 1995: 55.
Wyoming and Idaho: Youngblood *et al.* 1985.
Utah and Idaho: Padgett *et al.* 1989

LOW SHRUB ASSOCIATIONS

Cornus sericea ssp. sericea Association

Red-osier dogwood Association
18 plots. CEGL001165



Ecoregional Range
BM, BR

Environment and Soils
The Cornus sericea ssp. sericea Association is widespread in the southern and central Blue Mountains Ecoregion and across the Basin and Range Ecoregion. Sites are gravel and cobble streambanks and incipient floodplains and, occasionally, alluvial bars, with little soil development and frequent flooding disturbance. The local climate ranges shown in the table below show that this association occurs in a range of environments. Valleys are very narrow to wide, moderate to high gradient, V-, and box-shaped with moderately steep to steep sideslopes. Soils are undeveloped fragmental deposits of cobble and gravel that may have a thin loam to silt loam layer on surface Adjacent Rosgen stream reach types are A2, A3, , B1, B2, B3, B4 and C2.

Valley Environment	Average	Range
Elevation (ft)	4375	2880-5500
Plot Slope (%)	12	0.1-55
Valley Width (m)	34	5-200
Valley Gradient (%)	7	2-10
Valley Sideslopes (%)	58	45-70
Local Climate		
Mean Annual Precipitation (in.)	20	12-36
Mean Annual Snowfall (in.)	55	15-150
Mean Annual Temperature (F)	45	41-51
Mean Minimum Temperature (F)	33	29-40
Mean Maximum Temperature (F)	58	51-63
Median Date of Last Spring Freeze	June 9	May 12-July 4
Median Date of First Fall Freeze	Sep. 13	Aug. 26-Oct. 5
Soil Surface Cover (%)		
Submerged	4	0-25
Bare Ground	13	0-45
Gravel	3	0-15
Rock	20	0-75
Moss	20	0-80
Litter	36	tr-91

This association is based on dominance by red-osier dogwood, a rhizomatous, layering species. It may develop based on the chance seeding or rooting of red-osier dogwood on amenable sites before species that colonize similar sites, such as shining willow or other low-mid elevation willow species, can become established and dominate these sites.

Vegetation Composition
This association is characterized by a nearly monocultural shrub overstory of red-osier dogwood, averaging 2.5 meters in height. Occasionally occurring at moderate to high cover in the shrub understory are stinking swamp currant, Mackenzie's willow, yellow willow, arroyo willow, coyote willow, Scouler willow, Wood's rose and common snowberry. Daubenmire (1968) considered common snowberry and Wood's rose to have the same ecological indicator status in the Inland Northwest. Others (e.g. Crawford 2001; Manning and Padgett 1989) have considered the prevalence of Wood's rose to indicate excessive disturbance on sites. In this association, Wood's rose and golden currant are more prevalent on plots sampled in sagebrush upland vegetation zones and common snowberry is more prevalent on plots sampled in coniferous forest zones. Herbaceous understory species are generally low in cover and include: creeping spikerush, blue wildrye, tall mannagrass, stinging nettle, curly dock, field mint, prairie sage, western clematis. Average height of the herbaceous layer is 49 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Red-osier dogwood (*Cornus sericea*)	100	69	15-98
Wood's rose (*Rosa woodsii*)	61	4	tr-13
Golden currant (*Ribes aureum*)	33	1	tr-1
Common snowberry (*Symphoricarpos albus*)	28	8	tr-22
SEDGES and RUSHES			
Creeping spikerush (*Eleocharis palustris*)	28	1	tr-1
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	33	1	tr-3
Tall mannagrass (*Glyceria striata*)	28	3	tr-10
PERENNIAL FORBS			
Stinging nettle (*Urtica dioica*)	33	1	tr-3
Curly dock (*Rumex crispus*)	33	1	tr-1
Field mint (*Mentha arvensis*)	33	1	tr-1
Prairie sage (*Artemisia ludoviciana*)	33	1	--
Western clematis (*Clematis ligusticifolia*)	28	18	tr-40
Starry false Solomon's seal (*Maianthemum stellata*)	28	3	tr-9
Yarrow (*Achillea millefolium*)	28	1	tr-3
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	33	tr	--

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are:
terraces - grand fir/Rocky Mountain maple
sideslopes - grand fir/big huckleberry, Douglas fir/mallow ninebark, and Douglas fir, Ponderosa pine (*Pinus ponderosa*), big sagebrush (*Artemisia tridentata*), and western juniper (*Juniperus occidentalis*) associations. In many areas, this type occurs in *Artemisia tridentata* vegetation zones.

Successional Dynamics

The local climate ranges shown in table above indicate that this association occurs in a range of environments. On floodplains that develop soil profiles with finer-textured surface horizons, it can probably succeed to a variety of other associations when other shrubs (and possibly trees) become more established. Other shrub associations that are likely to develop from this association are the other red-osier dogwood associations described in this classification. In some cases, sites that were sampled and classified in this association may be chance occurrences of red-osier dogwood thickets within an area normally dominated by the Mountain alder-red-osier dogwood association.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997
Washington: Crawford 2001, Kovalchik (2000) described the Cornus stolonifera-Symphoricarpos albus Association, that included sites that would be part of this association
Idaho: Jankovsky-Jones *et al.* 2001
Nevada: Manning and Padgett 1995; Manning and Padgett also described a Cornus stolonifera-Salix community type which would correspond to some of the stands in this association
Montana: Hansen *et al.* 1995
Utah and southeastern Idaho: Padgett *et al.* (1989) describe a Cornus stolonifera/Heracleum lanatum (maximum) Community Type that would be included in this association
Colorado: Kittel *et al.* 1999

Cornus sericea ssp. sericea-Rubus parviflorus Association

Red-osier dogwood-thimbleberry Association
3 plots. New type

Ecoregional Range
BM

Environment and Soils

This association is probably unique to the eastern Blue Mountains in the Blue Mountains Ecoregion. It occurs at moderately low elevations below the local elevational limits of mountain alder and occurs within the grand fir (and possibly the Douglas fir) and upland vegetation zones in the Hell's Canyon National Recreation Area. These sites are shady, have high soil moisture (as shown by the 85% average moss cover) and more well-developed soils with higher organic matter content than soils in the Red-osier dogwood Association, since thimbleberry has a high nitrogen demand (Tirmenstein 1989). Fluvial geomorphic surfaces are floodplains in narrow to moderately wide, moderate to high gradient, V- and flat-shaped valleys with steep sideslopes. Adjacent Rosgen stream types are A3a+. Soils are alluvial deposits of cobble and gravel with silt loam surface layers 9-10 cm thick.

Valley Environment	Average	Range
Elevation (ft)	3390	2920-3700
Plot Slope (%)	10	1-17
Valley Width (m)	50	20-65
Valley Gradient (%)	7	2-10
Valley Sideslopes (%)	62	45-70
Local Climate		
Mean Annual Precipitation (in.)	21	16-25
Mean Annual Snowfall (in.)	42	36-47
Mean Annual Temperature (F)	45	44-46
Mean Minimum Temperature (F)	35	34-37
Mean Maximum Temperature (F)	55	54-56
Median Date of Last Spring Freeze	May 26	May 21-May 31
Median Date of First Fall Freeze	Sep. 23	Sep. 20-26
Soil Characteristics		
Thickness of Surface Horizon (cm)	9.5	9-10
Depth to 80% Coarse Fragments (cm)	9.5	9-10
Soil Surface Cover (%)		
Submerged	2	0-5
Bare Ground	1	0-2
Gravel	-	-
Rock	2	0-5
Moss	85	80-90
Litter	6	2-13

Vegetation Composition

Red-osier dogwood and thimbleberry form a dense shrub canopy. Other tall shrubs present at moderate to high amounts of cover are: oceanspray, Rocky Mountain maple and Pacific yew. Common understory shrubs are prickly currant, common snowberry and Baldhip rose. The herbaceous understory is sparse. Ladyfern is a prominent forb, which is another indicator of high soil moisture. The shrub overstory averages 2.8 m in height, and the shrub understory averages 0.9 m in height. Average height of the herbaceous layer is 46 cm. Biomass averages 300 lbs/acre, ranging from 267-333 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Red-osier dogwood (*Cornus sericea*)	100	37	30-40
Thimbleberry (*Rubus parviflorus*)	100	40	35-50
Prickly currant (*Ribes lacustre*)	67	39	8-70
Oceanspray (*Holodiscus discolor*)	67	26	12-40
Common snowberry (*Symphoricarpos albus*)	67	26	12-40
Rocky Mountain maple (*Acer glabrum*)	67	8	6-10
Pacific yew (*Taxus brevifolia*)	67	4	1-7
Baldhip rose (*Rosa gymnocarpa*)	67	2	1-2
SEDGES and RUSHES			
Dewey's sedge (*Carex deweyana*)	67	3	2-3
PERENNIAL FORBS			
Stream violet (*Viola glabella*)	67	8	tr-15
Mountain sweet cicily (*Osmorhiza berteroi*)	67	3	1-5
Common cowparsnip (*Heracleum maximum*)	67	3	2-4
Pathfinder (*Adenocaulon bicolor*)	67	3	tr-5
Enchanter's nightshade (*Circaea alpina*)	67	3	1-4
Creepingroot violet (*Viola canadensis* var. *rugulosa*)	67	1	tr-2
Heart-leaved miner's lettuce (*Claytonia cordifolia*)	67	1	--
Arrowleaf groundsel (*Senecio triangularis*)	67	1	tr-1
Sweet-scented bedstraw (*Galium triflorum*)	67	tr	--
FERNS and HORSETAILS			
Ladyfern (*Athyrium filix-femina*)	67	12	8-15
Common scouring Rush (*Equisetum hyemale*)	67	5	2-7
Brittle bladderfern (*Cystopteris fragilis*)	67	tr	--

Adjacent Vegetation
Upland vegetation adjacent to sites sampled:
terraces – Grand fir/Rocky Mountain maple;
sideslopes – Grand fir/pinegrass and Grand fir/Rocky Mountain maple.

Successional Dynamics
This association is probably fairly stable, so long as site characteristics do not change substantially. If fluvial surfaces are abandoned by stream and develop into less frequently flooded floodplains, grand fir and/or Douglas fir will probably become established, and this association may succeed to the Grand fir/Common snowberry, Grand fir/Rocky Mountain maple or Douglas fir/Rocky Mountain maple-mallow ninebark Associations.

Other Studies Documenting Association with Plot Data
none

Cornus sericea ssp. sericea-Acer glabrum Association

Red-osier dogwood-Rocky Mountain maple Association
4 plots. New type

Ecoregional Range
BM, EC?

Environment and Soils
The Red-osier dogwood-Rocky Mountain maple Association occurs at low to moderate elevations in upland coniferous forest zones in the northern and central Blue Mountains in the Blue Mountains Ecoregion. It may also occur in the northern East Cascades Ecoregion. In some locations this association may occur below the local elevational extent of mountain alder. Sites are streambanks and incipient floodplains in narrow to moderately wide, moderately high gradient, V-shaped and trough-shaped valleys with moderately steep to steep sideslopes. Soils are composed of cobbly alluvial deposits with 0-50 cm of loam to silt loam surface material. Water tables are 50-60 cm below the soil surface during the early to mid growing season. Adjacent Rosgen stream types are A4, B2, B3 and C3.

Valley Environment	Average	Range
Elevation (ft)	3833	1980-5290
Plot Slope (%)	13	3-35
Valley Width (m)	39	5-65
Valley Gradient (%)	5	2-7
Valley Sideslopes (%)	64	45-70
Local Climate		
Mean Annual Precipitation (in.)	26	23-28
Mean Annual Snowfall (in.)	77	57-100
Mean Annual Temperature (F)	44	42-46
Mean Minimum Temperature (F)	32	30-35
Mean Maximum Temperature (F)	55	54-56
Median Date of Last Spring Freeze	June 18	June 3-July 3
Median Date of First Fall Freeze	Sep. 10	Sep. 4-Sep. 17
Soil Characteristics		
Current Water Table Depth (cm)	58	56-60
Rooting Depth (cm)	25	20-30
Depth to 30% Coarse Fragments (cm)	19	0-56
Depth to 80% Coarse Fragments (cm)	36	0-56
Soil Surface Cover (%)		
Submerged	2	0-7
Bare Ground	8	0-22
Gravel	-	-
Rock	6	0-20
Moss	32	2-72
Litter	51	18-85

Vegetation Composition
Rocky Mountain maple dominates the shrub overstory, which averages 5 m in height, ranging from 4 to 8 m) and red-osier dogwood dominates the shrub understory, which averages 1 m, ranging from 0.9-1.5 m. Other important shrubs in the shrub understory are prickly currant, common snowberry and stinking swamp currant. The herbaceous understory is generally sparse and scattered. Characteristic species are Columbia brome, drooping woodreed, sweet-scented bedstraw, enchanter's nightshade, common cowparsnip, starry false-Solomon's seal and alpine mitrewort. Average height of the herbaceous layer is 81 cm, ranging from 71 to 91 cm. Herbaceous biomass averages 1317 lbs/acre, ranging from 333-2300 lbs/acre.

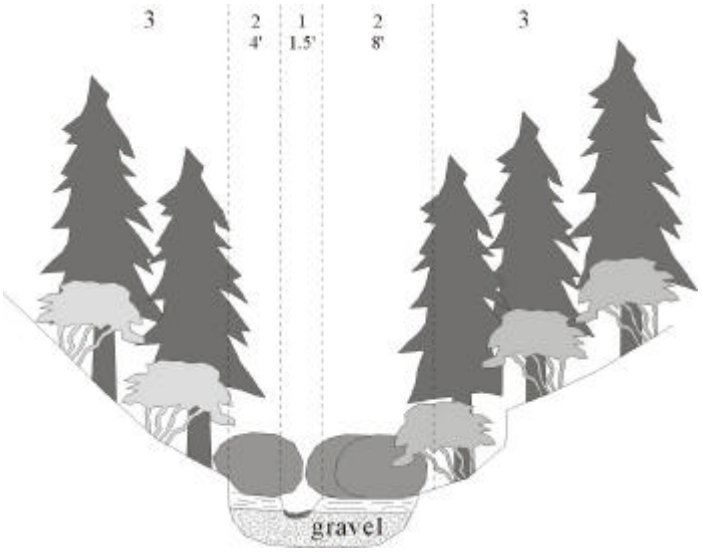
Adjacent Vegetation
Upland vegetation adjacent to sites sampled:
terraces – Grand fir/Queen's cup beadlily; Douglas fir/Black hawthorn;
sideslopes – Grand fir/Rocky Mountain maple; Douglas fir/mountain snowberry; and bunchgrass and other Douglas fir associations.

Successional Dynamics
This association is probably fairly stable, so long as site characteristics do not change substantially. If fluvial surfaces are abandoned by stream and develop into less frequently flooded floodplains or even terraces, this association will most likely succeed to the Grand fir/Rocky Mountain maple Association.

Other Studies Documenting Association
none

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE UNDERSTORY			
Grand fir (*Abies grandis*)	50	3	1-4
SHRUBS			
Red-osier dogwood (*Cornus sericea*)	100	57	13-95
Rocky Mountain maple (*Acer glabrum*)	100	22	10-50
Prickly currant (*Ribes lacustre*)	75	3	tr-6
Common snowberry (*Symphoricarpos albus*)	50	18	5-30
Stinking swamp currant (*Ribes hudsonianum*)	50	12	8-15
Oregon boxwood (*Pachistima myrsinites*)	50	1	tr-2
PERENNIAL GRASSES			
Columbia brome (*Bromus vulgaris*)	75	2	1-4
Drooping woodreed (*Cinna latifolia*)	50	2	1-2
Tall mannagrass (*Glyceria striata*)	25	35	--
PERENNIAL FORBS			
Sweet-scented bedstraw (*Galium triflorum*)	75	4	1-7
Enchanter's nightshade (*Circaea alpina*)	75	4	1-9
Common cowparsnip (*Heracleum maximum*)	75	3	2-4
Starry false Solomon's seal (*Maianthemum stellata*)	50	18	tr-35
Alpine mitrewort (*Mitella pentandra*)	50	3	tr-6
Baneberry (*Actaea rubra*)	50	3	2-3
Sharptooth angelica (*Angelica arguta*)	50	2	--
Large-leaf avens (*Geum macrophyllum*)	50	2	1-3
Claspleaf twistedstalk (*Streptopus amplexifolius*)	50	2	tr-3
Twayblade sp. (*Listera* sp.)	50	tr	--
Pink wintergreen (*Pyrola asarifolia*)	25	15	--
Oneleaf foamflower (*Tiarella trifoliata* var. *unifoliata*)	25	12	--
FERNS and HORSETAILS			
Ladyfern (*Athyrium filix-femina*)	50	2	--
Brittle bladderfern (*Cystopteris fragilis*)	50	tr	--

Illustrations



1 A4 stream reach
2 **Red-osier dogwood-Rocky Mountain maple**, banks
3 **Grand fir/Rocky Mountain maple**, south- and north-facing sideslopes

Trib. to N. Fk. West Camp Creek, Unity RD, Wallowa-Whitman NF; moderately high gradient, moderately high elevation, V-shaped valley; Blue Mountains Ecoregion

Cornus sericea ssp. sericea-Philadelphus lewisii Association

Red-osier dogwood-Lewis' mockorange Association
5 plots. New type

Valley Environment	Average	Range
Elevation (ft)	2225	1160-3140
Plot Slope (%)	8	5-10
Valley Width (m)	16	5-20
Valley Gradient (%)	8	5-10
Valley Sideslopes (%)	58	45-70
Local Climate		
Mean Annual Precipitation (in.)	11	10-12
Mean Annual Snowfall (in.)	19	17-23
Mean Annual Temperature (F)	48	47-51
Mean Minimum Temperature (F)	34	32-38
Mean Maximum Temperature (F)	63	61-64
Median Date of Last Spring Freeze	June 11	May 14-June 28
Median Date of First Fall Freeze	Sep. 12	Sep. 2-Sep. 27

Ecoregional Range
BM, BR, EC?

Environment and Soils
This association occurs on sites at moderately low to low elevations within the grassland zone of Hell's Canyon in the eastern Blue Mountains Ecoregion. It also occurs in the big sagebrush and western juniper zones of the Basin and Range Ecoregion, and of the high lava plains section of the western Blue Mountains Ecoregion. The local climate is slightly warmer and receives less snowfall and less total precipitation than areas in which the Red-osier dogwood-common chokecherry Association occurs. Sites are streambanks in narrow, high gradient, V- and box-shaped valleys with moderately steep to steep sideslopes. Adjacent Rosgen stream types are A3, F2 and F3.

Vegetation Composition
Red-osier dogwood forms a moderately dense to dense shrub understory with scattered to dense Lewis' mockorange in the shrub overstory. The herbaceous understory is scattered and sparse. The most commonly occurring species are smallfruit bulrush, blue wildrye, western clematis, teasel, curly dock, yarrow, hairy willow-herb, yellow monkeyflower, common mullein and scouring rush.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Red-osier dogwood (*Cornus sericea*)	100	46	15-85
Lewis' mockorange (*Philadelphus lewisii*)	100	29	8-70
Common chokecherry (*Prunus virginiana*)	60	2	tr-5
SEDGES and RUSHES			
Small-fruit bulrush (*Scirpus microcarpus*)	60	1	tr-3
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	60	2	tr-3
Kentucky bluegrass (*Poa pratensis*)	60	2	tr-3
PERENNIAL FORBS			
Western clematis (*Clematis ligusticifolia*)	80	2	tr-3
Teasel (*Dipsacus fullonum*)	60	2	tr-3
Curly dock (*Rumex crispus*)	60	tr	--
Yarrow (*Achillea millefolium*)	60	tr	--
Hairy willow-herb (*Epilobium ciliatum*)	60	tr	--
Yellow monkeyflower (*Mimulus guttatus*)	60	tr	--
Water hemlock (*Cicuta douglasii*)	40	19	tr-38
FERNS and HORSETAILS			
Common scouring rush (*Equisetum hyemale*)	60	4	tr-8
ANNUAL GRASSES and FORBS			
Cheatgrass (*Bromus tectorum*)	80	7	tr-25
Common mullein (*Verbascum thapsus*)	60	tr	--

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
Idaho fescue (*Festuca idahoensis*)-bluebunch wheatgrass (*Pseudoroegneria spicata*), big sagebrush (*Artemisia tridentata*), and western juniper (*Juniperus occidentalis*) associations

Successional Dynamics
This association will probably maintain a stable composition if site conditions do not change substantially, especially along F streams that are deeply incised within box canyons.

Other Studies Documenting Association with Plot Data
none

Cornus sericea ssp. sericea-Prunus virginiana Association

Red-osier dogwood-Common chokecherry Association
7 plots. New type

Ecoregional Range
BM, BR, EC

Environment and Soils
The Red-osier dogwood-common chokecherry Association occurs at moderately low elevations in the Ponderosa pine upland zone of the Blue Mountains Ecoregion and at moderately high elevations in the Basin and Range and East Cascades Ecoregions, within the sagebrush and western juniper upland vegetation zones. Sites are streambanks and alluvial bars in narrow to moderately wide, moderate to high gradient, V-shaped valleys with moderately steep to steep sideslopes. Adjacent Rosgen stream types are A2, A3, A4 and B3.

Valley Environment	Average	Range
Elevation (ft)	4505	2880-5100
Plot Slope (%)	12	2-30
Valley Width (m)	35	5-65
Valley Gradient (%)	7	2-10
Valley Sideslopes (%)	60	45-70
Local Climate		
Mean Annual Precipitation (in.)	19	13-23
Mean Annual Snowfall (in.)	49	38-62
Mean Annual Temperature (F)	46	44-48
Mean Minimum Temperature (F)	33	31-35
Mean Maximum Temperature (F)	59	58-61
Median Date of Last Spring Freeze	June 7	May 25-June 16
Median Date of First Fall Freeze	Sep. 16	Sep. 9-Sep. 26
Soil Surface Cover (%)		
Submerged	2	0-5
Bare Ground	19	0-40
Gravel	10	0-25
Rock	19	1-50
Moss	6	5-7
Litter	45	10-70

Vegetation Composition
Red-osier dogwood forms a moderately dense to dense shrub understory with scattered to dense chokecherry in the shrub overstory. Wood's rose is also common in the shrub understory. Several willow species occur at high cover in some plots: The herbaceous understory is scattered and sparse. The most commonly occurring species include cleavers, red columbine, sharptooth angelica, prairie sage, meadow goldenrod and cheatgrass.

Adjacent Vegetation
Upland vegetation adjacent to sites sampled consists of big sagebrush (*Artemisia tridentata*), low sagebrush (*Artemisia arbuscula*), western juniper (*Juniperus* occidentalis) and Ponderosa pine (*Pinus ponderosa*) associations.

Successional Dynamics

This association is probably fairly stable and will not succeed to another association unless site characteristics change substantially.

Other Studies Documenting Association with Plot Data

Nevada: Manning and Padgett (1995) describe a *Cornus sericea*/*Salix* spp. Community Type that overlaps with some of the sites in this *Cornus sericea* spp. *sericea*/*Prunus virginiana* Association.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Red-osier dogwood (*Cornus sericea*)	100	30	5-70
Common chokecherry (*Prunus virginiana*)	100	32	8-70
Wood's rose (*Rosa woodsii*)	86	7	tr-15
Common snowberry (*Symphoricarpos albus*)	43	5	tr-11
Golden currant (*Ribes aureum*)	43	2	1-3
Coyote willow (*Salix exigua*)	43	2	1-3
Western serviceberry (*Amelanchier alnifolia*)	43	2	tr-5
Lemmon willow (*Salix lemmonii*)	29	28	15-40
Shining willow (*Salix lucida*)	29	27	15-38
Mackenzie's willow (*Salix prolixa*)	29	10	tr-20
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	57	4	1-10
Blue wildrye (*Elymus glaucus*)	43	1	tr-3
Great Basin wildrye (*Leymus cinereus*)	43	1	tr-2
PERENNIAL FORBS			
Prairie sage (*Artemisia ludoviciana*)	57	2	tr-3
Starry false Solomon's seal (*Maianthemum stellata*)	43	4	tr-10
Red columbine (*Aquilegia formosa*)	43	4	tr-10
Sharptooth angelica (*Angelica arguta*)	43	2	tr-3
Yarrow (*Achillea millefolium*)	43	1	tr-3
Stinging nettle (*Urtica dioica*)	43	1	tr-3
Meadow goldenrod (*Solidago canadensis*)	43	tr	tr-1
Curly dock (*Rumex crispus*)	43	tr	--
ANNUAL GRASSES and FORBS			
Cleavers (*Galium aparine*)	57	1	tr-3
Cheatgrass (*Bromus tectorum*)	43	6	tr-15

Betula occidentalis-Philadelphus lewisii Association

Western birch-Lewis' mockorange Association
9 plots. CEGL002668

Ecoregional Range
BM, BR, CB

Environment and Soils

This association occurs at low to moderate elevations in the northwestern Basin and Range Ecoregion and in the western, central and southeastern Blue Mountains Ecoregion. Sites are streambanks in low to moderate gradient, narrow to moderately wide, V- and box-shaped valleys with moderately steep to steep sideslopes. Site surfaces have abundant exposed rock, gravel and bare soil. Adjacent Rosgen stream types are A2, B2, B3, B4 and one C3.

Valley Environment	Average	Range
Elevation (ft)	2945	2080-3690
Plot Slope (%)	4	1-8
Valley Width (m)	20	5-65
Valley Gradient (%)	6	2-10
Valley Sideslopes (%)	58	45-70
Local Climate		
Mean Annual Precipitation (in.)	14	11-18
Mean Annual Snowfall (in.)	28	16-40
Mean Annual Temperature (F)	48	43-50
Mean Minimum Temperature (F)	34	30-38
Mean Maximum Temperature (F)	61	57-63
Median Date of Last Spring Freeze	May 30	May 13-June 15
Median Date of First Fall Freeze	Sep. 21	Sep. 9-Sep. 30
Soil Surface Cover (%)		
Submerged	tr	0-5
Bare Ground	10	5-35
Gravel	6	tr-10
Rock	26	4-50
Cryptogam	2	0-5
Litter	56	tr-90

Vegetation Composition

Water birch forms a scattered to extremely dense very tall shrub/short tree overstory. Lewis' mockorange dominates the shrub understory, though sometimes at low cover. Other common shrubs are golden currant, Wood's rose, red-osier dogwood, and poison ivy. Understory herbaceous species are generally scattered at low cover although one site had a sward of creeping bentgrass (*Agrostis stolonifera*) and reed canarygrass (*Phalaris arundinacea*).

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Water birch (*Betula occidentalis*)	100	59	10-98
Lewis' mockorange (*Philadelphus lewisii*)	100	26	3-70
Poison ivy (*Toxicodendron rydbergii*)	67	7	1-20
Golden currant (*Ribes aureum*)	67	3	tr-8
Wood's rose (*Rosa woodsii*)	67	2	tr-3
Red-osier dogwood (*Cornus sericea*)	56	13	3-30
Coyote willow (*Salix exigua*)	33	23	3-50
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	56	1	tr-3
PERENNIAL FORBS			
Western clematis (*Clematis ligusticifolia*)	67	4	1-8
Yarrow (*Achillea millefolium*)	44	tr	--
Yellow monkeyflower (*Mimulus guttatus*)	44	tr	--
Climbing nightshade (*Solanum dulcamara*)	33	16	tr-40
ANNUAL GRASSES and FORBS			
Cheatgrass (*Bromus tectorum*)	57	re	--
Common mullein (*Verbascum thapsus*)	44	tr	--

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are: big sagebrush (*Artemisia tridentata*), Western juniper (*Juniperus occidentalis*) and Idaho fescue (*Festuca idahoensis*)-bluebunch wheatgrass (*Pseudoroegneria spicata*) associations

Successional Dynamics
This association is probably fairly stable and will not succeed to another association unless site characteristics change substantially.

Other Studies Documenting Association with Plot Data
Idaho: Moseley 1998: 42.

Betula occidentalis-Philadelphus lewisii-Amelanchier alnifolia-Symporicarpos albus Association

Water birch-mixed warm shrub Association
13 plots. CEGL000489

Ecoregional Range
BM, CB

Valley Environment	Average	Range
Elevation (ft)	2567	1340-5650
Plot Slope (%)	12	1-40
Valley Width (m)	55	5-350
Valley Gradient (%)	7	2-10
Valley Sideslopes (%)	47	15-70
Local Climate		
Mean Annual Precipitation (in.)	22	12-67
Mean Annual Snowfall (in.)	69	17-401
Mean Annual Temperature (F)	46	35-50
Mean Minimum Temperature (F)	35	25-39
Mean Maximum Temperature (F)	57	46-61
Median Date of Last Spring Freeze	May 29	May 10-June 11
Median Date of First Fall Freeze	Sep. 22	Sep. 28-Oct. 5
Soil Surface Cover (%)		
Submerged	4	0-12
Bare Ground	4	0-30
Gravel	7	0-70
Rock	12	0-60
Moss	17	0-60
Litter	52	5-95

Environment and Soils
This association occurs at moderately low to low elevations in the Hell's Canyon National Recreation Area and the lower Wenaha Canyon in the northeastern part of the Blue Mountains Ecoregion. It also occurs at moderate elevations in the central Blue Mountains within the grand fir and higher Douglas fir zone. Mean annual temperatures are more moderate (the minimum is higher and the maximum is lower) and the frost-free season is slightly longer than for the Western birch-Lewis' mockorange Association. At lower elevations sites are streambanks and floodplains in narrow to moderately wide, moderate to high gradient (mostly high gradient), V- and trough-shaped valleys with moderately steep to steep sideslopes. Adjacent Rosgen stream types are A2, A3, A4, B4 and one C3. The stream systems along which this association is found are very dynamic. Most of the flow occurs during the winter and early spring. This high, early season water flow through these generally high gradient, narrow valleys results in frequent sediment scour and deposition on sites. This association is very common along the steep perennial tributaries in the Hell's Canyon section of the Snake River. At higher elevations sites are floodplains in narrow to moderately wide, moderate to high gradient, trough-shaped valleys with gentle to moderately steep sideslopes. Adjacent Rosgen stream types are C3 and D3.

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
terraces – Grand fir/Queen's cup beadlily;
sideslopes - Douglas fir/Common snowberry, Curl-leaf mountain mahogany (*Cercocarpus ledifolius*), and other Ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*) and Idaho fescue (*Festuca idahoensis*)-bluebunch wheatgrass (*Pseudoroegneria spicata*) associations

Vegetation Composition

Water birch forms a scattered to very dense shrub overstory on all sites. Lewis' mockorange is the most consistent member of the shrub middlestory. It is only absent Associated middlestory shrubs, western serviceberry, oceanspray, black hawthorn, Rocky Mountain maple, blue elderberry, netleaf hackberry, cascara and common chokecherry, vary from site to site at low to moderate cover. The shrub understory is also variable and is generally composed of one or more of the following: poison ivy, common snowberry, red-osier dogwood, mallow ninebark, Wood's rose, thimbleberry, snow gooseberry and birchleaf spiraea. The herbaceous layer can be sparse to abundant in cover and commonly consists of weedy native (manyflower tonella, stinging nettle, enchanter's nightshade, miner's lettuce) and introduced (cleavers, burdock, chervil, common hounds-tongue) species. On higher elevation sites lower elevation shrubs such as poison ivy, cascara, netleaf hackberry, Lewis' mockorange, mallow ninebark and Wood's rose are lacking. Also, the herbaceous layer comprises a different set of dominant species: showy aster, wartberry fairy-bells, tall bluebells, leafy aster and Columbia monkshood, which are indicative of a moderate elevation forested environment. Herbaceous biomass averaged 629 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Water birch (*Betula occidentalis*)	100	47	10-90
Lewis' mockorange (*Philadelphus lewisii*)	85	21	6-40
Western serviceberry (*Amelanchier alnifolia*)	69	5	tr-20
Common snowberry (*Symphoricarpos albus*)	62	27	2-80
Oceanspray (*Holodiscus discolor*)	54	19	2-40
Red-osier dogwood (*Cornus sericea* spp. *sericea*)	54	15	tr-60
Black hawthorn (*Crataegus douglasii*)	54	12	2-25
Rocky Mountain maple (*Acer glabrum*)	54	11	2-30
Poison ivy (*Toxicodendron rydbergii*)	54	8	tr-40
Blue elderberry (*Sambucus nigra* ssp. *cerulea*)	46	6	tr-15
Mallow ninebark (*Physocarpus malvaceus*)	39	6	tr-20
Wood's rose (*Rosa woodsii*)	39	2	1-5
Birchleaf spiraea (*Spiraea betulifolia*)	39	2	tr-2
Common chokecherry (*Prunus virginiana*)	39	14	3-40
Netleaf hackberry (*Celtis laevigata* var. *reticulata*)	31	12	tr-25
Thimbleberry (*Rubus parviflorus*)	31	8	tr-20
Cascara (*Frangula purshiana*)	31	5	1-12
Snow gooseberry (*Ribes niveum*)	31	2	1-4
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	46	8	tr-30
PERENNIAL FORBS			
Feathery Solomonplume (*Maianthemum racemosa*)	62	1	tr-5
Common hounds-tongue (*Cynoglossum officinale*)	46	tr	tr-1
Manyflower tonella (*Tonella floribunda*)	39	5	tr-20
Western meadowrue (*Thalictrum occidentale*)	39	4	tr-10
Burdock (*Arctium minus*)	39	3	tr-12
Stinging nettle (*Urtica dioica*)	39	tr	tr-1
Enchanter's nightshade (*Circaea alpina*)	31	23	1-40
Heart-leaved miner's lettuce (*Claytonia cordifolia*)	31	3	tr-10
Mountain sweet cicily (*Osmorhiza berteroi*)	31	1	tr-2
Teasel (*Dipsacus sylvestris*)	31	tr	tr-1
Dandelion (*Taraxacum officinale*)	31	tr	--
ANNUAL GRASSES and FORBS			
Cleavers (*Galium aparine*)	69	9	tr-50
Chervil (*Anthriscus caucalis*)	62	20	tr-50
Cheatgrass (*Bromus tectorum*)	39	17	tr-40
Miners lettuce (*Claytonia perfoliata* ssp. *perfoliata*)	39	15	tr-60

Successional Dynamics

At lower elevations in the Hell's Canyon area and the Wenaha canyon, this association is probably fairly stable and will not succeed to another association unless site characteristics change substantially. The composition of shrubs and relative cover of each shrub species may change over the years as a result of frequent disturbance by scour and deposition. At higher elevations in the central Blue Mountains, this association may be successional to a forested association such as Grand fir/common snowberry or Douglas fir/black hawthorn-common snowberry.

Other Studies Documenting Association

Washington: Crawford (2001) described a Water birch/common snowberry Association that is probably the equivalent of this association.

*Crataegus douglasii-Rhamnus alnifolia Association**

Black hawthorn-Alder-leaved buckthorn Association
2 plots. New type

Ecoregional Range

BM, EC?

Environment and Soils

The Black hawthorn-alder-leaved buckthorn Association is an uncommon moderate elevation type that was only sampled in the Wallowa Mountains but may also occur in the central Blue Mountains of the Blue Mountains Ecoregion and in the southeastern East Cascades Ecoregion. Sites are floodplains in moderately wide, high gradient, V-shaped valleys with moderately steep to steep sideslopes. Adjacent Rosgen stream types are B4 and C3.

Valley Environment	Average	Range
Elevation (ft)	3860	3640-4080
Plot Slope (%)	4	3-5
Valley Width (m)	65	--
Valley Gradient (%)	5	--
Valley Sideslopes (%)	58	45-70
Climate		
Mean Annual Precipitation (in.)	32	27-37
Mean Annual Snowfall (in.)	115	106-123
Mean Annual Temperature (F)	43	42-44
Mean Minimum Temperature (F)	32	28-35
Mean Maximum Temperature (F)	54	53-56
Median Date of Last Spring Freeze	June 22	June 4-July 9
Median Date of First Fall Freeze	Sep. 7	Aug. 22-Sep. 22
Soil Characteristics		
Depth to 80% Coarse Fragments (cm)	13	10-15
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	8	0-15
Gravel	3	0-5
Rock	2	0-4
Cryptogam	26	1-50
Litter	63	50-75

Vegetation Composition

Black hawthorn is the sole dominant of the shrub overstory. Alder-leaved buckthorn, a strongly rhizomatous species, forms the shrub understory. The presence of the buckthorn may prevent other shrub species from becoming established. Characteristic forbs and grasses are blue wildrye, Kentucky bluegrass, nodding fescue, common cowparsnip, western meadowrue, sweet-scented bedstraw, mountain sweet cicily, wood's strawbeery and Columbia monkshood. Herbaceous biomass averages 400 lbs/acre, ranging from 100-700 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Grand fir (*Abies grandis*)	50	2	-
SHRUBS			
Black hawthorn (*Crataegus douglasii*)	100	58	50-65
Alder-leaved buckthorn (*Rhamnus alnifolia*)	100	63	45-80
Serviceberry (*Amelanchier alnifolia*)	100	3	2-3
Red-osier dogwood (*Cornus sericea*)	50	15	-
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	100	2	1-2
Kentucky bluegrass (*Poa pratensis*)	50	25	-
Nodding fescue *(Festuca subulata)*	50	15	-
PERENNIAL FORBS			
Common cowparsnip (*Heracleum maximum*)	100	8	1-15
Western meadowrue (*Thalictrum alpinum*)	100	7	3-10
Sweet-scented bedstraw (*Galium triflorum*)	100	3	2-4
Mountain sweet cicily (*Osmorhiza berteroi*)	100	3	1-4
Woods strawberry (*Fragaria vesca*)	100	2	-
Columbia monkshood (*Aconitum columbianum*)	100	2	1-3
Green false hellebore (*Veratrum viride*)	100	2	1-2
Starry false Solomon's seal (*Maianthemum stellata*)	100	2	1-2
Butterweed groundsel (*Senecio serra*)	100	1	-
Dandelion (*Taraxacum officinale*)	100	1	tr-1

Adjacent Vegetation

Upland vegetation adjacent to sites sampled:
sideslopes - Douglas fir/Mallow ninebark; grand fir associations

Successional Dynamics

With further development of floodplains into terraces and the subsequent change in site characteristics, this association may be successional to a Douglas fir or grand fir association.

Other Studies Documenting Association

none

Crataegus douglasii-Rosa woodsii Association

Black hawthorn-Wood's rose Association
4 plots. CEGL001095

Ecoregional Range
BM, BR

Environment and Soils
The Black hawthorn-Wood's rose Association occurs at moderately high elevations in the Basin and Range and southeastern Blue Mountains Ecoregions.

Vegetation Composition
Black hawthorn forms a dense (nearly impenetrable) thicket that dominates the shrub overstory. Wood's rose is present at low cover in the understory. Other shrubs are scarce. The herbaceous layer is sparse as the ground is heavily shaded and because these sites have generally been well used as resting sites by livestock for the last 150 years.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Black hawthorn (*Crataegus douglasii*)	100	78	70-90
Wood's rose (*Rosa woodsii*)	100	8	3-10
Common chokecherry (*Prunus virginiana*)	75	2	tr-3
Golden currant (*Ribes aureum*)	75	2	tr-3
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	100	7	1-20
PERENNIAL FORBS			
Yarrow (*Achillea millefolium*)	100	tr	--
Dandelion (*Taraxacum officinale*)	75	tr	--
Yellow monkeyflower (*Mimulus guttatus*)	50	4	tr-8
Mountain sweet cicily (*Osmorhiza berteroi*)	50	2	tr-3
Catnip (*Nepeta cataria*)	50	tr	tr-1
Stinging nettle (*Urtica dioica*)	50	8	--
Bolander's yampa (*Perideridia bolanderi*)	50	tr	--
Duckweed (*Lemna minor*)	50	tr	--

Adjacent Vegetation
Upland vegetation adjacent to sites sampled consists of big sagebrush (*Artemisia tridentata*) associations

Successional Dynamics
This association may be the disturbed association that results from overgrazing the *Crataegus douglasii/Symphoricarpos albus* Association.

Other Studies Documenting Association with Plot Data
Washington: Crawford 2001
Idaho: Jankovsky-Jones *et al.* 2001

Crataegus douglasii-Symphoricarpos albus Association

Black hawthorn-Common snowberry Association
6 plots. CEGL001096.

Ecoregional Range
BM, CB

Environment and Soils
The Black hawthorn-common snowberry Association was sampled at moderately low to moderate elevations in the eastern Blue Mountains Ecoregion. It also occurs in the Columbia Basin Ecoregion and may occurs in the southwestern East Cascades Ecoregion. Sites are terraces and basins in moderately wide to wide, low to moderate gradient, flat- and V-shaped valleys with moderately steep sideslopes. Soils consist of silt loam to fine sandy loam surface horizons that range from 14-31 cm thick over fine-textured subsoil horizons or old gravel-cobble streambeds. These sites are infrequently flooded, and the water table is 60-150 cm. below the soil surface by mid-summer. Stream reach types of adjacent streams are B3, B4, G3 and F4. Streams are 0.5-10 m wide.

Valley Environment	Average	Range
Elevation (ft)	3693	3030-4602
Plot Slope (%)	8	tr-37
Valley Width (m)	92	65-200
Valley Gradient (%)	6	5-7
Valley Sideslopes (%)	50	45-70
Local Climate		
Mean Annual Precipitation (in.)	50	34-67
Mean Annual Snowfall (in.)	263	125-401
Mean Annual Temperature (F)	39	35-42
Mean Minimum Temperature (F)	28	25-31
Mean Maximum Temperature (F)	50	46-54
Median Date of Last Spring Freeze	June 27	June 12-July 11
Median Date of First Fall Freeze	Sep. 5	Aug. 28-Sep. 13
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	11	0-25
Gravel	-	-
Rock	tr	0-4
Cryptogam	22	0-80
Litter	66	19-99

Vegetation Composition
Black hawthorn is the sole dominant in the shrub overstory, ranging from moderate to extremely dense cover. Common snowberry typifies the shrub understory. It occasionally occurs at low cover where sites have been heavily grazed by livestock. Herbaceous understory components commonly include: Kentucky bluegrass, blue wildrye, starry false-Solomon's seal, western meadowrue, sweet-scented bedstraw and large-leaf avens. Height of shrub overstory averages 4.7 m. Shrub understory averages 1.5 m. Average height of the herbaceous layer is 58 cm, ranging from 41-76 cm. Herbaceous biomass averages 696 lbs/acre, ranging from 100-1167 lbs/acre.

Adjacent Vegetation
terraces – Black hawthorn (*Crataegus douglasii*) associations on opposite terraces;
sideslopes – Douglas fir/Mallow ninebark; and other Douglas fir, ponderosa pine and Idaho fescue (*Festuca idahoensis*)-bluebunch wheatgrass (*Pseudoroegneria spicata*) associations

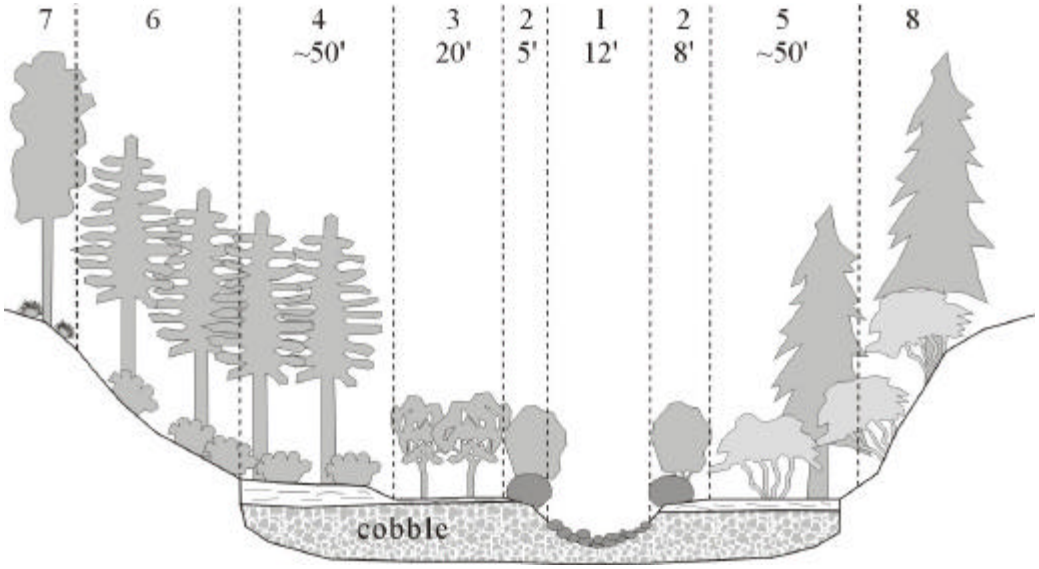
Successional Dynamics
If this site is disturbed through overgrazing by livestock it may be degraded to the Crataegus douglasii/Rosa woodsii Association. With lack of fire, this association may succeed to a forested association, such as Douglas fir/black hawthorn-common snowberry or Ponderosa pine/black hawthorn-common snowberry.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Black hawthorn (*Crataegus douglasii*)	100	77	15-95
Common snowberry (*Symphoricarpos albus*)	100	30	1-70
Idaho gooseberry (*Ribes oxyacanthoides* ssp. *irriguum*)	33	5	2-8
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	33	14	7-20
Blue wildrye (*Elymus glaucus*)	33	8	5-11
PERENNIAL FORBS			
Starry false Solomon's seal (*Maianthemum stellata*)	67	3	1-7
Western meadowrue (*Thalictrum alpinum*)	50	17	1-40
Sweet-scented bedstraw (*Galium triflorum*)	50	8	2-15
Large-leaf avens (*Geum macrophyllum*)	50	4	tr-10
Stinging nettle (*Urtica dioica*)	50	3	tr-5
Mountain sweet cicily (*Osmorhiza berteroi*)	50	3	1-6
Common hound's-tongue (*Cynoglossum officinale*)	50	2	1-3
Wartberry fairy-bells (*Disporum trachycarpum*)	50	tr	tr-1
Wood's strawberry (*Fragaria vesca*)	50	tr	--
Feathery Solomonplume (*Maianthemum racemosa*)	33	13	5-20

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997 described a *Crataegus douglasii* association which is similar to this
Washington: Crawford 2001

Illustrations

1 B3 stream reach
2 **Mountain alder-red-osier dogwood**, banks
3 **Black hawthorn/common snowberry**, 1st terrace-inactive floodplain
4 **Douglas fir/common snowberry**, terrace
5 **Grand fir/Rocky Mountain maple-mallow ninebark**, terrace
6 **Douglas fir/common snowberry**, southwest-facing toeslope
7 **Ponderosa pine/Idaho fescue-bluebunch wheatgrass**, southwest-facing sideslope
8 **Grand fir/Rocky Mountain maple**, northeast-facing sideslope



Little Elk Creek, Pine RD, Wallowa-Whitman NF; moderately high gradient, moderately low elevation, V-shaped valley; Blue Mountains Ecoregion

Crataegus douglasii-Philadelphus lewisii-Physocarpus malvaceus-Acer glabrum-Prunus virginiana Association

Douglas' hawthorn-Lewis' mockorange-ninebark-Rocky Mountain maple-common chokecherry Association
13 plots. New type

Ecoregional Range
BM, CB, EC?

Environment and Soils

This association is very common along the steep perennial tributaries in the Hell's Canyon section of the Snake River in the Blue Mountains Ecoregion and also occurs in the Columbia Basin Ecoregion. It may occur in the northern part of the East Cascades Ecoregion. Sites are streambanks and floodplains in moderate to high gradient, very narrow to moderately wide, V- and trough-shaped valleys with gentle to steep sideslopes. Soils generally consist of a shallow silt loam to gravelly loam surface horizon over a skeletal subsoil comprised of alluvial and/or colluvial deposits. A few soil horizons have seep fine-textured subsoils. Adjacent Rosgen stream types are A3, A4, B3, B4, and C3.

Valley Environment	Average	Range
Elevation (ft)	2954	1900-4040
Plot Slope (%)	11	tr-85
Valley Width (m)	42	5-65
Valley Gradient (%)	5	2-10
Valley Sideslopes (%)	46	15-70
Local Climate		
Mean Annual Precipitation (in.)	18	14-34
Mean Annual Snowfall (in.)	35	14-115
Mean Annual Temperature (F)	47	43-51
Mean Minimum Temperature (F)	36	34-39
Mean Maximum Temperature (F)	59	52-63
Median Date of Last Spring Freeze	May 26	May 6-June 9
Median Date of First Fall Freeze	Sep. 25	Sep. 19-Oct. 3
Soil Characteristics		
Rooting Depth (cm)	30	15-50
Depth to 30% Coarse Fragments (cm)	8	0-20
Depth to 80% Coarse Fragments (cm)	18	5-38
Soil Surface Cover (%)		
Submerged	1	0-8
Bare Ground	12	0-60
Gravel	tr	0-1
Rock	1	0-3
Cryptogam	19	0-82
Litter	70	13-99

Vegetation Composition

Black hawthorn is usually the dominant in the shrub overstory and may form a dense thicket, but can also be co-dominant with the other overstory shrubs, Lewis' mockorange, serviceberry, Rocky Mountain maple, blue elderberry, oceanspray, and cascara. Lewis' mockorange is the most frequently co-occurring overstory shrub. Other species occur at varying constancy and cover. The shrub understory comprises a mix of shrubs, which also occur at varying constancy and cover: common snowberry, mallow ninebark, Wood's rose, currants, poison ivy, thimbleberry, birchleaf spiraea and red-osier dogwood. Characteristic herbaceous species are blue wildrye, miners lettuce, cleavers, chervil, enchanter's nightshade, mountain sweet cicily, stinging nettle, western meadowrue, heartleaf arnica and manyflower tonella. Height of shrub overstory averages 6.3 m, ranging from 4.6 to 9.2 m. Shrub understory height averages 2.5 m, ranging from 1.2 to 4.6 m. Herbaceous layer averages 69 cm, ranging from 25 to 183 cm. Herbaceous biomass averages 693 lbs/acre, ranging from 96 to 2301 lbs/acre.

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are:
terraces – Douglas fir (*Pseudotsuga menziesii*)/Rocky Mountain maple (*Acer glabrum*)-mallow ninebark (*Physocarpus malvaceus*), Grand fir (*Abies grandis*)/Rocky Mountain maple, other black hawthorn associations; sideslopes – grand fir/Rocky Mountain maple, Ponderosa pine (*Pinus ponderosa*)/bluebunch wheatgrass (*Pseudoroegneria spicata*), mountain mahogany (*Cercocarpus ledifolius*), Idaho fescue (*Festuca idahoensis*)-bluebunch wheatgrass (*Pseudoroegneria spicata*) and bluebunch wheatgrass associations

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Black hawthorn (*Crataegus douglasii*)	100	63	30-95
Lewis' mockorange (*Philadelphus lewisii*)	85	13	tr-35
Common snowberry (*Symphoricarpos albus*)	77	7	tr-40
Serviceberry (*Amelanchier alnifolia*)	46	4	1-8
Rocky Mountain maple (*Acer glabrum*)	39	14	2-40
Mallow ninebark (*Physocarpus malvaceus*)	39	12	5-30
Wood's rose (*Rosa woodsii*)	39	8	1-15
Blue elderberry (*Sambucus nigra* ssp. *cerulea*)	39	6	tr-15
Currants (*Ribes*)	39	3	2-5
Common chokecherry (*Prunus virginiana*)	31	26	10-63
Oceanspray (*Holodiscus discolor*)	31	19	1-40
Poison ivy (*Toxicodendron rydbergii*)	31	14	1-40
Thimbleberry (*Rubus parviflorus*)	23	8	1-20
Cascara (*Frangula purshiana*)	23	4	3-5
Birchleaf spiraea (*Spiraea betulifolia*)	23	3	2-5
Red-osier dogwood (*Cornus sericea* spp. *sericea*)	15	13	4-21
SEDGES and RUSHES			
Dewey's sedge (*Carex deweyana*)	54	10	tr-40
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	92	4	tr-20
Kentucky bluegrass (*Poa pratensis*)	54	14	tr-70
PERENNIAL FORBS			
Enchanter's nightshade (*Circaea alpina*)	46	20	tr-60
Mountain sweet cicily (*Osmorhiza berteroi*)	39	8	tr-30
Stinging nettle (*Urtica dioica*)	39	3	tr-9
Heart-leaf arnica (*Arnica cordifolia*)	31	8	tr-30
Manyflower tonella (*Tonella floribunda*)	31	7	tr-15
Western meadowrue (*Thalictrum alpinum*)	31	5	tr-15
Sweet-scented bedstraw (*Galium triflorum*)	31	3	tr-6
Common hounds-tongue (*Cynoglossum officinale*)	31	1	tr-3
Feathery Solomonplume (*Maianthemum racemosa*)	31	tr	tr-1
Creepingroot violet (*Viola canadensis* var. *rugulosa*)	23	20	4-50
ANNUAL GRASSES and FORBS			
Miners lettuce (*Claytonia perfoliata* ssp. *perfoliata*)	53	5	tr-10
Cleavers (*Galium aparine*)	46	16	tr-70
Chervil (*Anthriscus caucalis*)	43	34	tr-70

Successional Dynamics

Only where this association occurs on true floodplains with lower gradients is this association likely to succeed to some type of conifer association dominated by Ponderosa pine or Douglas fir in the tree overstory. In high gradient, gully-type formations (characteristic of the smaller tributaries to the Snake River) these sites are not successional to any other association. The dynamic nature of the riparian systems in which they occur and the frequent disturbance of the geomorphic surfaces on which the vegetation grows will perpetuate this species mix. All of the species in this association readily and vigorously re-sprout from rhizomes or root crowns following low to high severity fires.

Other Studies Documenting Association

none

Acer glabrum-Amelanchier alnifolia-Prunus virginiana

Rocky Mountain maple-western serviceberry-common chokecherry Association
10 plots. New type

Ecoregional Range
BM, BR, CB, EC

Environment and Soils

The Rocky Mountain maple-western serviceberry-common chokecherry Association was sampled in the Blue Mountains Ecoregion but probably occurs in all of the eastern Oregon Ecoregions within Ponderosa pine and western juniper upland zones. Rocky Mountain maple has only been found in the eastern Blue Mountains Ecoregion so this sites elsewhere would be dominated by western serviceberry and common chokecherry. Sites are streambanks, small floodplains, springs and talus edges. Where sites are alluvial they are in narrow, high gradient and V- and trough-shaped valleys with gentle sideslopes.

Valley Environment	Average	Range
Elevation (ft)	4123	1820-5580
Plot Slope (%)	38	7-82
Valley Width (m)	10	5-20
Valley Gradient (%)	13	5-30
Valley Sideslopes (%)	45	--
Local Climate		
Mean Annual Precipitation (in.)	25	12-62
Mean Annual Snowfall (in.)	89	9-397
Mean Annual Temperature (F)	44	35-52
Mean Minimum Temperature (F)	33	25-41
Mean Maximum Temperature (F)	56	45-65
Median Date of Last Spring Freeze	June 9	May 2-July 11
Median Date of First Fall Freeze	Sep. 14	Aug. 26-Oct. 18
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	3	0-10
Gravel	1	0-5
Rock	21	0-99
Cryptogam	26	0-50
Litter	64	20-90

Vegetation Composition

The shrub overstory is dominated by Rocky Mountain maple, common chokecherry and/or western serviceberry. Lewis' mockorange, oceanspray and black hawthorn are occasionally present at low cover. Common snowberry is the most constant member of the shrub understory and is often dominant. Other shrub understory species are mallow ninebark, Wood's rose, birchleaf spiraea and thimbleberry. The herbaceous layer comprises mainly blue wildrye, bluebunch wheatgrass, yarrow, Wood's strawberry, nettleleaf horsemint, bearded wheatgrass, and cleavers.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Common snowberry (*Symphoricarpos albus*)	90	15	1-50
Rocky Mountain maple (*Acer glabrum*)	70	39	3-90
Western serviceberry (*Amelanchier alnifolia*)	70	21	3-65
Common chokecherry (*Prunus virginiana*)	50	34	5-70
Mallow ninebark (*Physocarpus malvaceus*)	50	9	1-15
Wood's rose (*Rosa woodsii*)	50	6	tr-15
Lewis' mockorange (*Philadelphus lewisii*)	50	6	1-15
Birchleaf spiraea (*Spiraea betulifolia*)	30	12	5-20
Thimbleberry (*Rubus parviflorus*)	30	7	3-15
Oceanspray (*Holodiscus discolor*)	20	13	5-20
Black hawthorn (*Crataegus douglasii*)	20	9	5-13
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	50	3	tr-10
Bluebunch wheatgrass (*Pseudoroegneria spicata*)	40	6	1-15
Bearded wheatgrass (*Elymus caninus*)	30	8	1-20
PERENNIAL FORBS			
Yarrow (*Achillea millefolium*)	60	tr	tr-1
Woods strawberry (*Fragaria vesca*)	50	11	tr-40
Nettleleaf horsemint (*Agastache urticifolia*)	50	8	tr-30
Heartleaf arnica (*Arnica cordata*)	40	tr	tr-1
Feathery Solomonplume (*Maianthemum racemosa*)	30	tr	t--
ANNUAL GRASSES and FORBS			
Cleavers (*Galium aparine*)	50	16	1-40

Adjacent Vegetation

sideslopes – Ponderosa pine/birchleaf spiraea-western serviceberry and other Ponderosa pine; western juniper, white oak (*Quercus garryana*) and Idaho fescue (*Festuca idahoensis*)-bluebunch wheatgrass (*Pseudoroegneria spicata*) associations

Successional Dynamics

This association is probably not successional to another association. All of the characteristic shrub species will readily resprout from rhizomes or root crowns following topkill by fire.

Other Studies Documenting Association with Plot Data

Oregon: Kovalchik (1987) described a Mixed shrub canyon bottom association that includes sites that would fit this association

Washington: Crawford (2001) described two associations that would fit within this one, Amelanchior alnifolia and Prunus virginiana; Kovalchik (2001) described an Acer glabrum association that would fit in this association

Idaho: Holmstead (2001) and Jankovsky-Jones *et al.* (2001) both described a Prunus virginiana association that is similar to this association

Nevada: Manning and Padgett (1995) described a Prunus virginiana-Rosa woodsii community type that would fit within this association

Montana: Hansen *et al.* (1995) described a Prunus virginiana community type that would fit within this association

Colorado: Kittel *et al.* (1999) described a Prunus virginiana association that would fit within this association

Saskatchewan: Thompson and Hansen (2001) described a Prunus virginiana community type that would fit within this association

Philadelphus lewisii Association

Lewis' mockorange Association
7 plots. CEGL001170

Valley Environment	Average	Range
Elevation (ft)	3096	2100-4202
Plot Slope (%)	43	1-80
Valley Width (m)	130	20-350
Local Climate		
Mean Annual Precipitation (in.)	21	15-28
Mean Annual Snowfall (in.)	54	14-72
Mean Annual Temperature (F)	44	42-51
Mean Minimum Temperature (F)	32	29-39
Mean Maximum Temperature (F)	57	55-63
Median Date of Last Spring Freeze	June 10	May 9-June 24
Median Date of First Fall Freeze	Sep. 8	Aug. 30-Oct. 3
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	tr	0-4
Gravel	-	-
Rock	63	0-99
Cryptogam	21	0-60
Litter	27	5-100

Ecoregional Range
BM, BR?, CB?, EC?

Environment and Soils

The Lewis' mockorange Association was sampled only in the northeastern part of the Blue Mountains Ecoregion but probably occurs in the Columbia Basin Ecoregion, the northern East Cascades Ecoregion and the far northwestern Basin and Range Ecoregion.

Sites are skeletal alluvial bars, incipient floodplains or talus edges where groundwater accumulates or underground springs flow.

Vegetation Composition

Lewis' mockorange is the shrub overstory dominant. Scattered blue elderberry is common on most sites. The herbaceous layer can be sparse to abundant in cover. Characteristic species are bluebunch wheatgrass, Kentucky bluegrass, cleavers, cheatgrass, varileaf phacelia, chervil, common cowparsnip, nettleleaf horsemint and miners lettuce.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Lewis' mockorange (*Philadelphus lewisii*)	100	61	25-85
Blue elderberry (*Sambucus nigra* ssp. *cerulea*)	71	10	1-15
Common chokecherry (*Prunus virginiana*)	43	2	tr-3
Serviceberry (*Amelanchier alnifolia*)	43	2	tr-3
Whitestem gooseberry (*Ribes inerme*)	29	13	10-15
PERENNIAL GRASSES			
Bluebunch wheatgrass (*Pseudoroegneria spicata*)	57	2	1-3
Kentucky bluegrass (*Poa pratensis*)	43	11	8-15
PERENNIAL FORBS			
Common cowparsnip (*Heracleum maximum*)	29	16	2-30
Nettleleaf horsemint (*Agastache urticifolia*)	29	5	4-5
ANNUAL GRASSES and FORBS			
Cleavers (*Galium aparine*)	57	15	5-40
Cheatgrass (*Bromus tectorum*)	43	11	1-30
Varileaf phacelia (*Phacelia heterophylla*)	43	1	--
Chervil (*Anthriscus caucalis*)	29	30	10-50
Miners lettuce (*Claytonia perfoliata* ssp. *perfoliata*)	29	17	3-30
Tiny trumpet (*Collomia linearis*)	29	1	--

Adjacent Vegetation

sideslopes – Mallow ninebark (*Physocarpus malvaceus*)-red-osier dogwood (*Cornus sericea* spp. *sericea*) and Ponderosa pine (*Pinus ponderosa*), bluebunch wheatgrass, and Idaho fescue-bluebunch wheatgrass associations

Successional Dynamics

This association is probably not successional to another association on talus edges or along steep gradient streams. On alluvial bars of floodplains or lower gradient streams this association may be successional to the White alder (*Alnus rhombifolia*)/Lewis' mockorange Association. All of the characteristic shrub species will readily resprout from rhizomes or root crowns following topkill by fire.

Other Studies Documenting Association with Plot Data

Washington: Crawford (2001) described a *Philadelphus lewisii/Symphoricarpos albus* Association that is included in this association

Idaho: Jankovsky-Jones *et al.* 2001; Holmstead 2001; Miller (1976) described a *Philadelphus lewisii/Symphoricarpos albus* Association that is included in this association

Celtis laevigata var. reticulata-Philadelphus lewisii Association

Netleaf hackberry-Lewis' mockorange Association
6 plots. CEGL000792.

Ecoregional Range

BM, CB

Environment and Soils

The Netleaf hackberry/Lewis' mockorange Association is found at low elevations along the Snake River in the Blue Mountains and Columbia Basin Ecoregions. Sites are streambanks and high floodplains in very narrow to wide, high gradient, trough-, box- and V-shaped valleys with gentle to steep sideslopes. Adjacent Rosgen stream types are A3 and B3. Soils have high coarse fragment contents.

Valley Environment	Average	Range
Elevation (ft)	1610	1290-1850
Plot Slope (%)	12	4-60
Valley Width (m)	63	5-200
Valley Gradient (%)	9	5-10
Valley Sideslopes (%)	43	15-70
Local Climate		
Mean Annual Precipitation (in.)	15	13-19
Mean Annual Snowfall (in.)	20	14-37
Mean Annual Temperature (F)	50	49-51
Mean Minimum Temperature (F)	39	37-40
Mean Maximum Temperature (F)	62	61-64
Median Date of Last Spring Freeze	May 13	May 8-May 20
Median Date of First Fall Freeze	Oct. 2	Sep. 28-Oct. 7
Soil Surface Cover (%)		
Submerged	2	0-10
Bare Ground	tr	0-3
Gravel	6	0-30
Bedrock	7	0-20
Rock	1	0-6
Moss	7	0-30
Litter	73	47-92

Vegetation Composition

Netleaf hackberry forms a scattered to dense tall shrub layer. Lewis' mockorange is a co-dominant. Blue elderberry and oceanspray occasionally occur with low to moderate cover. Poison ivy is often present in the shrub understory. The herbaceous layer is dominated by weedy introduced forbs and grasses as a result of heavy use of these sites by livestock for many decades. The most commonly found species are chervil, cleavers, cheatgrass, miners lettuce and common hounds-tongue. Average herbaceous biomass is 820 lbs/acre, ranging from 224 to 1067 lbs/acre.

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are:
terraces – black cottonwood (*Populus balsamifera* spp. *trichocarpa*)associations;
sideslopes – netleaf hackberry/Poison ivy, bluebunch wheatgrass-Sandberg's bluegrass**,** spiny greasebush (*Glossopetalon spinescens* var. *aridum*) and other bluebunch wheatgrass (*Pseudoroegneria spicata*) associations

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Netleaf hackberry (*Celtis laevigata* var. *reticulata*)	100	48	10-75
Lewis' mockorange (*Philadelphus lewisii*)	100	44	5-60
Poison ivy (*Toxicodendron rydbergii*)	50	18	5-40
Oceanspray (*Holodiscus discolor*)	33	35	10-60
Blue elderberry (*Sambucus nigra* ssp. *cerulea*)	33	15	5-25
PERENNIAL FORBS			
Common hounds-tongue (*Cynoglossum officinale*)	50	tr	--
Stinging nettle (*Urtica dioica*)	33	1	--
ANNUAL GRASSES and FORBS			
Chervil (*Anthriscus caucalis*)	83	51	25-60
Cleavers (*Galium aparine*)	83	15	5-30
Cheatgrass (*Bromus tectorum*)	50	23	3-40
Miners lettuce (*Claytonia perfoliata* ssp. *perfoliata*)	50	12	5-20

Successional Dynamics

This association may be successional to a Netleaf hackberry/Bluebunch wheatgrass Association if water tables become lower and soils drier.

Other Studies Documenting Association with Plot Data

Washington: Crawford 2001

MID ELEVATION SHRUB ASSOCIATIONS

Ribes lacustre-Ribes hudsonianum/Cinna latifolia Association

Prickly currant-stinking swamp currant/Drooping woodreed Association
5 plots. CEGL003445

Ecoregional Range
BM, EC

Environment and Soils
This association occurs in the northern half of the Blue Mountains, mostly above the local elevational range of Sitka alder. Valley types are very narrow and V-shaped with moderately steep to very steep side slopes. Valley gradients are moderately steep to very steep. Fluvial surfaces on which this association occurs are floodplains, streambanks, and gravel bars. Stream reach types associated with site locations are A2, B3, B4, and D4. Boulder, cobble, and gravel bedloads are predominant. Streams are 0.5-5 m wide with debris affecting 10-50% of the active channel. Soils are Typic Endoaquents and one Aeric Fluvaquent. Textures range from silty clay to sandy loam surface horizons that grade into water-worked cobbles and gravel at the level of the old stream bed. The soil remains relatively wet throughout the growing season. Sites are often flooded during peak runoff.

Soil Profile Characteristics	Average
Bedrock/Parent Material(s)	basalt, andesite
Water Table Depth (cm)	avg: 40; range: 20-56
Total Rooting Depth (cm)	avg: 31; range 8-56
Depth to Redoximorphic Features	20
Depth to 20% Coarse Fragments (cm)	avg: 23; range 0-56
Depth to 80% Coarse Fragments (cm)	avg: 32; range 18-56
Surface Layer	
Thickness (cm)	8-20
Texture(s)	silt loam, loam, sandy loam
Coarse Fragments (%)	0-20, gravel
Roots	very fine: many fine: few to many medium: few to many coarse: none to few
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	15-44
Texture(s)	silty clay, silt loam, loam
Coarse Fragments (%)	0-30, gravel
Roots	very fine: common to many fine: few to many medium: few to many coarse: none to few
Redoximorphic Features	some iron concentrations
Substrate	gravel, cobble

Valley Environment	Average	Range
Elevation (ft)	4472	4320-4830
Plot Slope (%)	9	3-28
Valley Width (m)	14	5-20
Valley Gradient (%)	4	2-10
Valley Sideslopes (%)	55	45-70
Soil Characteristics		
Rooting Depth (cm)	31	8-56
Depth to Wet Soil (cm)	17	0-51
Water Table Depth (cm)	40	20-56
Depth to 20% Coarse Frags (cm)	23	0-56
Depth to 80% Coarse Frags (cm)	32	18-56
Soil Surface Cover (%)		
Submerged	4	0-12
Bare Ground	3	0-6
Gravel	2	0-7
Rock	2	0-5
Moss	43	1-90
Liverwort	6	0-15
Lichen	1	0-2
Litter	34	1-90

Vegetation Composition

Currants form a scattered canopy over a rich mixture of graminoids and wet forbs. Drooping woodreed is generally abundant and is about 1m tall. Wet forbs include brook saxifrage, Columbia monkshood, stinging nettle, heart-leaf miner's lettuce, alpine mitrewort, and common cowparsnip. Average height of the herbaceous layer is 53 cm (ranging from 30-79 cm). Herbaceous biomass is 834 lbs/acre (ranging from 150-1833 lbs/ac).

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
UNDERSTORY TREES			
Engelmann spruce (*Picea engelmannii*)	60	2	1-3
Grand fir (*Abies grandis*)	60	1	--
SHRUBS			
Prickly currant (*Ribes lacustre*)	100	13	4-25
Stinking swamp currant (*Ribes hudsonianum*)	60	39	14-53
Sitka alder (*Alnus viridus* spp. *sinuata*)	60	8	7-10
PERENNIAL GRASSES			
Drooping woodreed (*Cinna latifolia*)	100	25	5-75
PERENNIAL FORBS			
Brook saxifrage (*Saxifraga odontoloma*)	100	6	1-14
Stinging nettle (*Urtica dioica*)	80	6	1-20
Heart-leaved miner's lettuce (*Claytonia cordifolia*)	80	2	1-3
Columbia monkshood (*Aconitum columbianum*)	80	1	1-3
Alpine mitrewort (*Mitella pentandra*)	60	16	2-30
Common cowparsnip (*Heracleum maximum*)	60	6	1-10
Oneleaf foamflower (*Tiarella trifoliata* var. *unifoliata*)	60	5	2-10
Hairy willow-herb (*Epilobium ciliatum*)	60	4	1-10
Enchanter's nightshade (*Circaea alpina*)	60	4	1-10
Arrowleaf groundsel (*Senecio triangularis*)	60	4	1-9
Large-leaf avens (*Geum macrophyllum*)	60	3	1-7
Sweet-scented bedstraw (*Galium triflorum*)	60	3	tr-5
Baneberry (*Actaea rubra*)	60	2	1-3
Broadleaf bluebells (*Mertensia ciliata*)	60	1	--
FERNS and ALLIES			
Ladyfern (*Athyrium filix-femina*)	100	4	1-12

Adjacent Vegetation

Vegetation types adjacent to sites sampled are:
terraces - grand fir/Pacific yew/queen's cup beadlily;
sideslopes - grand fir/Rocky Mountain maple, grand fir/oakfern and other moist grand fir associations.

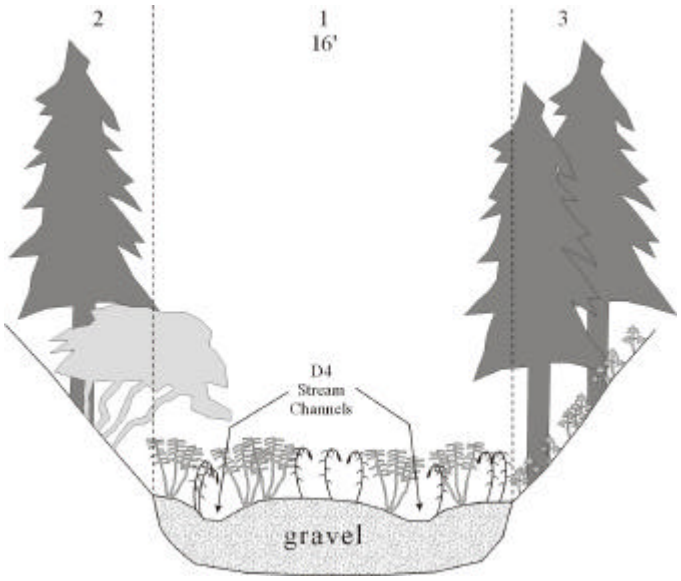
Successional Dynamics

This association may be seral to the Sitka alder/Drooping woodreed or Sitka alder/Ladyfern Associations on sites where sediments are stable for long enough periods of time that Sitka alder can become established. Sitka alder establishment may also be promoted by the opening up of the adjacent upland conifer canopy is opened up.

Nearby Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997.

Illustrations



1. **Currants/drooping woodreed**, floodplain
2. **Grand fir/Rocky Mountain maple**, northwest-facing toeslope
3. **Grand fir/oakfern**, southeast-facing toeslope

N. Fk. Walla Walla River, Walla Walla RD, Umatilla NF; mod. low gradient, mod. elevation, V-shaped valley.

Ribes lacustre-Ribes hudsonianum/Glyceria striata Association

Prickly currant-stinking swamp currant/Tall mannagrass Association
13 plots. CEGL003446

Ecoregional Range
BM, EC

Environment and Soils
This association occurs throughout the Blue Mountains and in parts of the East Cascades at moderate to moderately high elevations mostly above the local elevational range of mountain alder. Valleys are very narrow and V- or trough-shaped with very high gradients and gentle to moderately steep side slopes. Fluvial surfaces are floodplains and stream banks. Streams were A3, A4 and B3 Rosgen types and 0.5-4 m wide with 10-50% of the active stream channel affected by woody debris. The soils are Typic Endoaquents that consist of shallow (20-30 cm), fine-textured mineral deposits over the gravel and cobbles of the buried stream bed.

Valley Environment	Average	Range
Elevation (ft)	5018	3920-6340
Plot Slope (%)	20	2-80
Valley Width (m)	50	5-200
Valley Gradient (%)	19	2-80
Valley Sideslopes (%)	35	15-45
Soil Characteristics		
Depth to Wet Soil (cm)	11	0-25
Water Table Depth (cm)	25	20-35
Depth to 20% Coarse Frags	19	0-31
Depth to 80% Coarse Frags	22	2-31
Soil Surface Cover (%)		
Bare Ground	6	0-25
Gravel	1	0-5
Rock	4	0-20
Bedrock	1	0-15
Moss	51	5-90
Liverwort	2	0-10
Litter	32	0-84

Vegetation Composition

Prickly and stinking swamp currants (averaging 1 m in height) form a scattered to dense canopy over tall mannagrass and a variety of mesic forbs. Average height of herbaceous vegetation is 37 cm (ranging from 20-51 cm).

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE UNDERSTORY			
Engelmann spruce (*Picea engelmannii*)	54	3	1-9
SHRUBS			
Prickly currant (*Ribes lacustre*)	100	18	3-24
Stinking swamp currant (*Ribes hudsonianum*)	54	27	1-80
Mountain alder (*Alnus incana*)	54	7	1-15
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	69	12	2-35
Drooping woodreed (*Cinna latifolia*)	54	3	1-5
PERENNIAL FORBS			
Sweet-scented bedstraw (*Galium triflorum*)	77	4	1-7
Claspleaf twistedstalk (*Streptopus amplexifolius*)	62	5	1-15
Enchanter's nightshade (*Circaea alpina*)	54	8	1-15
Columbia monkshood (*Aconitum columbianum*)	54	5	1-15
Alpine mitrewort (*Mitella pentandra*)	54	4	1-15
Brook saxifrage (*Saxifraga odontoloma*)	46	10	1-20
Pathfinder (*Adenocaulon bicolor*)	46	5	1-15
Arrowleaf groundsel (*Senecio triangularis*)	46	4	1-10

Adjacent Vegetation

Adjacent sideslope vegetation types were:
terraces -Subalpine fir (*Abies lasiocarpa*)/Grouse huckleberry (*Vaccinium scoparium*)
sideslopes - Grand fir (*Abies grandis*)/Twinflower (*Linnaea borealis*), Grand fir/Geyer's sedge (*Carex geyeri*), Grand fir/Queen's cup beadlily (*Clintonia uniflora*), Lodgepole pine (*Pinus contorta*)/Big huckleberry (*Vaccinium membranaceum*)-twinflower, and Subalpine fir (*Abies lasiocarpa*) and Engelmann spruce associations. In lower elevation, drier upland areas: Douglas fir (*Pseudotsuga menziesii*) and Curl-leaf mountain mahogany (*Cercocarpus ledifolius*) associations

Successional Dynamics

This community type may be occasionally seral to Mountain alder/Prickly currant-stinking swamp currant Association, as indicated by the presence of scattered and successfully reproducing mountain alder through the community. On sites with high tall mannagrass (*Glyceria striata*) cover, this association may be seral to the Mountain alder/Tall mannagrass Association. At higher elevations, especially along very steep, very narrow streams, it is probably the latest seral stage that will occur on the fluvial surface.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997

Alnus incana/Carex amplifolia Association

Mountain alder/Bigleaf sedge Association
10 plots. CEGL001148 = *Alnus incana/mesic graminoids.*

Ecoregional Range
BM, EC

Environment and Soils
The mountain alder/bigleaf sedge association is found at moderate elevations in forested areas of the Blue Mountains and East Cascades. Valleys are narrow and generally V- or trough-shaped with low to moderately high gradients. This association occurs predominantly in springs.

Some occurrences are on floodplains or on channel shelves with a spring source from the adjacent toe-slope or streambank. Water is often ponded on the site or is found near the soil surface. Soils are Endoaqepts, Humaquepts, and Endoaquolls. Soils are deep, fine-textured mineral or organic material that remain wet throughout the growing season. There may be some chemical factor in the spring water where mountain alder/bigleaf sedge occurs that encourages the growth of the big-leaved sedge. There are other mountain alder communities that occur on springs in the Blue Mountains that are not dominated by bigleaf sedge.

Valley Environment	Average	Range
Elevation (ft)	4322	2440-5870
Plot Slope (%)	6	0-26
Valley Width (m)	35	5-65
Valley Gradient (%)	3	2-7
Valley Sideslopes (%)	39	15-45
Soil Surface Cover (%)		
Submerged	18	0-50
Bare Ground	5	0-20
Gravel	tr	0-1
Moss	21	0-85
Liverwort	1	0-5
Litter	59	0-90

Soil Profile Characteristics	
Water Table Depth (cm)	avg: 23 (range: 0-58)
Total Rooting Depth (cm)	avg. 29 (range: 15-45)
Depth to Redoximorphic Features (cm)	avg: 16 (range: 5-28)
Surface Layer	
Thickness (cm)	10-28
Texture(s)	sapric, fibric organic, fine and medium sandy loam
Coarse Fragments (%)	0
Roots	very fine: many fine: many medium: few coarse: few
Redoximorphic Features	some iron oxidation and reduction
Subsurface Layer(s)	
Thickness (cm)	31-80
Texture(s)	sapric, hemic organic, clay loam, silt loam, loam, fine to medium sandy loam
Coarse Fragments (%)	0-30, gravel
Roots	very fine: common to many fine: none to many medium: none to common coarse: none to few
Redoximorphic Features	some iron oxidation and reduction
Substrate	clay loam, sandy loam, gravel

Vegetation Composition
Mountain alder (averaging 4 m in height, ranging from 2-6 m) forms a dense canopy over a tall (76 cm), thick graminoid layer of big-leaved sedge and tall mannagrass. Wet forbs, including yellow monkey-flower, musk monkey-flower, sweet-scented bedstraw, and hairy willow-herb, comprise a scattered herbaceous understory. Average herbaceous biomass is 1718 lbs/acre (ranging from 1000-3248 lbs/acre).

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Mountain alder (*Alnus incana*)	100	60	15-93
Red-osier dogwood (*Cornus sericea*)	50	10	3-20
Prickly currant (*Ribes lacustre*)	50	4	1-9
SEDGES and RUSHES			
Bigleaf sedge (*Carex amplifolia*)	100	48	11-98
Small-fruit bulrush (*Scirpus microcarpus*)	60	5	1-15
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	100	25	1-90
Nodding Fescue *(Festuca subulata)*	40	3	1-5
PERENNIAL FORBS			
Yellow monkeyflower (*Mimulus guttatus*)	70	4	1-15
Sweet-scented bedstraw (*Galium triflorum*)	70	3	1-5
Hairy willow-herb (*Epilobium ciliatum*)	70	2	1-5
Large-leaf avens (*Geum macrophyllum*)	50	2	1-5
FERNS and ALLIES			
Ladyfern (*Athyrium filix-femina*)	50	13	1-50
Common horsetail (*Equisetum arvense*)	50	4	1-15

Adjacent Vegetation

Adjacent upland plant associations are: terraces - Grand fir/Queen's cup beadlily; sideslopes - grand fir/Grouse huckleberry, grand fir/Big huckleberry, grand fir/pinegrass, and other grand fir associations.

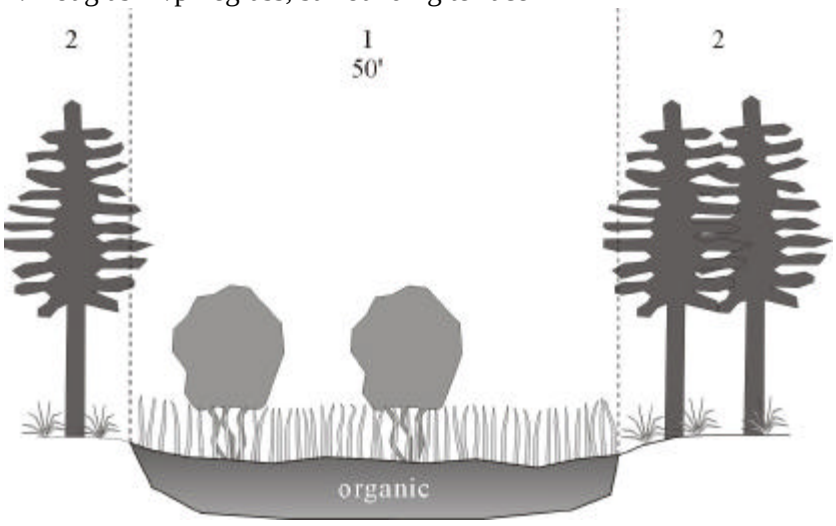
Nearby Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997

Washington: Kovalchik (2001) describes a mountain alder/small-fruit bulrush association that includes mountain alder/bigleaf sedge plots.

Illustrations

1. **Mountain alder/big-leaved sedge**, spring
2. Douglas fir/pinegrass, surrounding terrace



Crane Creek, Malheur NF; very low gradient, mod. elevation, trough-shaped spring on terrace of Crane Creek

Alnus incana/Scirpus microcarpus Association

Mountain alder/Smallfruit bulrush Association
6 plots. CEGL000481

Ecoregional Range
BM, CB, EC

Environment and Soils
The mountain alder/smallfruit bulrush association occurs in V- and trough-shaped valleys at moderate elevations in the Blue Mountains and East Cascades. Landforms are streambanks, channel shelves, and springs, and soils were mineral with fine sandy loam surface textures and organic peats and mucks (fibric and hemic histosols). Sites are very wet with the water table at or above the soil surface much of the growing season. Streams adjacent to sites sampled are Rosgen C3 and C4 types.

Valley Environment	Average	Range
Elevation (ft)	4683	4000-5200
Plot Slope (%)	5	0-20
Valley Width (m)	95	20-200
Valley Gradient (%)	7	2-20
Valley Sideslopes (%)	53	45-70
Soil Characteristics		
Depth to 80% Coarse Frags	32	0-64
Soil Surface Cover (%)		
Submerged	30	10-50
Bare Ground	35	1-70
Gravel	3	0-5
Rock	2	0-5
Moss	8	0-25
Litter	40	22-84

Vegetation Composition
The vegetation consists of a scattered to dense overstory of mountain alder averaging 5 m in height with a scattering of red-osier dogwood, common snowberry and currants in the shrub understory (averaging 1 m in height). Herbaceous cover is dominated by small-fruit bulrush with small amounts of mesic forbs scattered throughout. Average height of herbaceous vegetation is 91 cm. Average biomass is 983 lbs/acre (ranging from 600-1366 lbs/acre).

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Mountain alder (*Alnus incana*)	100	59	26-80
Red-osier dogwood (*Cornus sericea*)	50	7	2-15
Common snowberry (*Symphoricarpos albus*)	50	4	2-8
SEDGES and RUSHES			
Small-fruit bulrush (*Scirpus microcarpus*)	100	35	5-90
Soft-leaved sedge (*Carex disperma*)	50	1	1-2
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	67	8	2-20
Kentucky bluegrass (*Poa pratensis*)	50	2	1-3
PERENNIAL FORBS			
Starry false Solomon's seal (*Maianthemum stellata*)	100	3	1-8
Hairy willow-herb (*Epilobium ciliatum*)	83	3	1-10
Leafy aster (*Symphyotrichum foliaceum* var. *foliaceum*)	67	3	2-5
Large-leaf avens (*Geum macrophyllum*)	67	3	1-5
Yarrow (*Achillea millefolium*)	67	1	--
Field mint (*Mentha arvensis*)	50	4	1-10
American speedwell (*Veronica americana*)	50	4	1-10
FERNS and ALLIES			
Common horsetail (*Equisetum arvense*)	83	1	1-3
Common scouring Rush (*Equisetum hyemale*)	50	1	--

Adjacent Vegetation

Adjacent upland vegetation types are:
terraces - Grand fir (*Abies grandis*)/pinegrass (*Calamagrostis rubescens*) and other grand fir associations;
sideslopes - Grand fir/pinegrass and other grand fir associations

Nearby Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997.
Washington: Kovalchik 2001'

Alnus incana/Carex pellita Association

Mountain alder/Woolly sedge Association
6 plots. CEGL001144

Ecoregional Range
BM, BR, EC

Environment and Soils
Sites were sampled on in the Blue Mountains and East Cascades ecoregions at moderately low to moderately high elevations Valleys in which this association occurs are low gradient, V- or trough-shaped, narrow to wide with gentle to moderately steep side slopes. Associated Rosgen stream types are 0.5 to 10 m wide E5 and B streams with little organic debris affecting the active stream channel. Soils comprise deep, fine-textured mineral material with seasonally high water tables that probably drop to below the woolly sedge rooting zone by the end of the growing season.

Valley Environment	Average	Range
Elevation (ft)	4628	2960-5600
Plot Slope (%)	4	2-11
Valley Width (m)	53	5-200
Valley Gradient (%)	2	--
Valley Sideslopes (%)	39	15-45
Soil Characteristics		
Rooting Depth (cm)	37	23-56
Water Table Depth (cm)	48	40-56
Soil Surface Cover (%)		
Submerged	3	0-10
Bare Ground	18	0-50
Gravel	6	0-20
Rock	3	0-10
Moss	8	0-37
Litter	62	20-100

Vegetation Composition
Mountain alder forms a scattered to dense canopy averaging 5m in height. Woolly sedge abundance varies inversely with mountain alder canopy cover as it is somewhat shade intolerant. Other species commonly commonly scattered throughout the herbaceous layer are Baltic rush, small wing sedge, large-leaf avens and common horsetail. Herbaceous species average 46 cm (ranging from 31 to 61 cm). Biomass averages 2770 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Mountain alder (*Alnus incana*)	100	53	15-90
Common Snowberry *(Symphoricarpos albus)*	67	7	1-13
SEDGES and RUSHES			
Woolly sedge (*Carex pellita*)	100	26	10-40
Baltic rush (*Juncus balticus*)	50	13	2-25
Swordleaf rush (*Juncus ensifolius*)	50	1	--
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	100	3	1-8
PERENNIAL FORBS			
Large-leaf avens (*Geum macrophyllum*)	100	2	1-5
Yarrow (*Achillea millefolium*)	50	1	1-3
Common Self-heal *(Prunella vulgaris)*	50	1	--
Hairy willow-herb (*Epilobium ciliatum*)	50	1	--
FERNS and ALLIES			
Common horsetail (*Equisetum arvense*)	50	10	1-15

Adjacent Vegetation
Adjacent upland vegetation types are: sideslopes - ponderosa pine associations.

Nearby Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997

Alnus incana/Calamagrostis canadensis Association

Mountain alder/Bluejoint reedgrass Association
4 plots. CEGL001143

Valley Environment	Average	Range
Elevation (ft)	4857	4500-5220
Plot Slope (%)	2	1-2
Valley Width (m)	155	65-200
Valley Gradient (%)	2	--
Valley Sideslopes (%)	43	15-70
Soil Characteristics		
Rooting Depth (cm)	41	20-81
Water Table Depth (cm)	60	51-74
Soil Surface Cover (%)		
Submerged	3	0-10
Bare Ground	25	0-70
Moss	6	0-12
Litter	66	18-95

Ecoregional Range
BM, EC

Environment and Soils
The mountain alder/bluejoint reedgrass association was sampled at three locations in the Blue and Wallowa Mountains. Valleys in which this association occurs are wide and low gradient and contain 5-25 m wide C-type streams with as much as 30% of the stream channel affected by large woody debris. Soils consist of deep, fine-textured mineral deposits. The water table may be at or above the soil surface at the beginning of the growing season but drops to 50-75 cm below the surface by the end of the growing season.

Vegetation Composition
Mountain alder forms an open to moderately closed canopy (averaging 4m in height, ranging from 3 to 6 m) over a dense stand of bluejoint reedgrass (average height 130 cm). Several tall forb species are scattered through the herbaceous layer, which ranges from 102 to 153 cm in height. Herbaceous biomass averages 1430 lbs/acre (ranging from 1130 to 1730 lbs/acre).

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
UNDERSTORY TREES			
Engelmann spruce (*Picea engelmannii*)	67	2	1-2
SHRUBS			
Mountain alder (*Alnus incana*)	100	47	30-70
PERENNIAL GRASSES			
Bluejoint reedgrass (*Calamagrostis canadensis*)	100	55	40-75
Tall mannagrass (*Glyceria striata*)	100	11	2-20
PERENNIAL FORBS			
Western coneflower (*Rudbeckia occidentalis*)	100	9	1-20
Sharptooth angelica (*Angelica arguta*)	100	3	1-6
Large-leaf avens (*Geum macrophyllum*)	100	1	1-2
Sweet-scented bedstraw (*Galium triflorum*)	100	1	--
Common cowparsnip (*Heracleum maximum*)	67	2	1-4
White bog-orchid (*Habenaria dilatata*)	67	1	1-2
Mountain sweet cicily (*Osmorhiza berteroi*)	67	1	--
FERNS and ALLIES			
Common horsetail (*Equisetum arvense*)	100	1	--
ANNUAL and BIENNIAL FORBS			
Bull thistle (*Cirsium vulgare*)	67	1	--

Adjacent Vegetation
Vegetation types adjacent to sites sampled are: terraces -lodgepole pine-(grand fir)/pinegrass and subalpine fir-Engelmann spruce associations; sideslopes - lodgepole pine-(grand fir) /grouse huckleberry /pinegrass and subalpine fir-Engelmann spruce associations.

Nearby Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997
Washington: Kovalchik 2001

Alnus incana/Carex utriculata Association

Mountain alder/Bladder sedge Association
6 plots. New type

Ecoregional Range
BM, EC?

Environment and Soils
This association is found at moderate elevations across the Blue and Wallowa Mountains north of the Strawberry and Aldrich Mountains. It is very common in eastern Washington and may be a mesic equivalent to the Booth willow-Geyer's willow/Bladder sedge Association that is abundant in the Great Basin and similar continental climatic zones. Valleys are generally wide and flat or trough-shaped with low gradients. Fluvial surfaces are floodplains or wet basins where flat topography, poor drainage, beaver dams, road crossings, and other obstructions flood alder sites. Adjacent Rosgen stream reach types are C4, C5, E5 and E6. Soils are Saprists (mucks), Hemists (mucky peats), Endoaquolls, or Endoaqepts. Mineral soils are generally very organic-matter rich and may eventually become Saprists or Hemists. Estimated water holding capacity is high in the organic soils. The soils are saturated to the surface well into the summer, and the rooting zone remains saturated throughout the growing season except in drought years.

Valley Environment	Average	Range
Elevation (ft)	4955	4400-6000
Plot Slope (%)	1	tr-2
Valley Width (m)	125	20-200
Valley Gradient (%)	3	2-5
Valley Sideslopes (%)	35	15-45
Soil Surface Cover (%)		
Submerged	6	0-30
Bare Ground	19	0-50
Gravel	-	-
Rock	-	-
Moss	6	0-30
Liverwort	10	0-60
Litter	47	2-85

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt, glacial moraines, mixed sedimentary
Water Table Depth (cm)	avg: 34 (range: 8-74)
Total Rooting Depth (cm)	avg. 39 (range: 13-56)
Surface Layer	
Thickness (cm)	5-38
Texture(s)	hemic, sapric organic, silt loam, loam, medium sandy loam
Coarse Fragments (%)	0
Roots	very fine: many fine: common to many medium: none to common coarse: none to few
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	0-38
Texture(s)	sapric organic, silt loam, fine to coarse sandy loam, loamy sand
Coarse Fragments (%)	0-60, gravel
Roots	very fine: common to many fine: common to many medium: none to many coarse: few
Redoximorphic Features	some iron oxidation
Substrate	gravel, loamy sand, organics

Vegetation Composition
The stand is dominated by a canopy of mountain alder, with an average height of 5.3 m (ranging from 5 to 15 m). Bladder sedge is the dominant graminoid. Forb species richness is low due to wet sites, and the dense cover of alder and sedges. The herbaceous layer averages 73 cm in height (ranging from 51 to 102 cm). Herbaceous biomass averages 2344 lbs/acre (ranging from 1533 to 2367 lbs/acre).

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Mountain alder (*Alnus incana*)	100	32	15-60
Bearberry honeysuckle (*Lonicera involucrata*)	33	6	2-10
SEDGES and RUSHES			
Bladder sedge (*Carex utriculata*)	100	43	25-80
Cusick's sedge (*Carex cusickii*)	50	14	1-30
Small-fruit bulrush (*Scirpus microcarpus*)	50	3	1-5
Aquatic sedge (*Carex aquatilis* var. *aquatilis*)	33	37	3-70
Woolly sedge (*Carex pellita*)	33	28	5-50
PERENNIAL GRASSES			
Weak alkaligrass (*Torreyochloa pallida* var. *pauciflora*)	33	8	--
Kentucky bluegrass (*Poa pratensis*)	33	6	2-10
PERENNIAL FORBS			
American speedwell (*Veronica americana*)	67	6	tr-20
Large-leaf avens (*Geum macrophyllum*)	50	3	2-5
Hairy willow-herb (*Epilobium ciliatum*)	50	3	2-4
Western polemonium (*Polemonium occidentale*)	50	2	1-4
Field mint (*Mentha arvensis*)	50	2	1-2
Water hemlock (*Cicuta douglasii*)	33	9	7-10
Starry false Solomon's seal (*Maianthemum stellata*)	33	7	3-10

Adjacent Vegetation

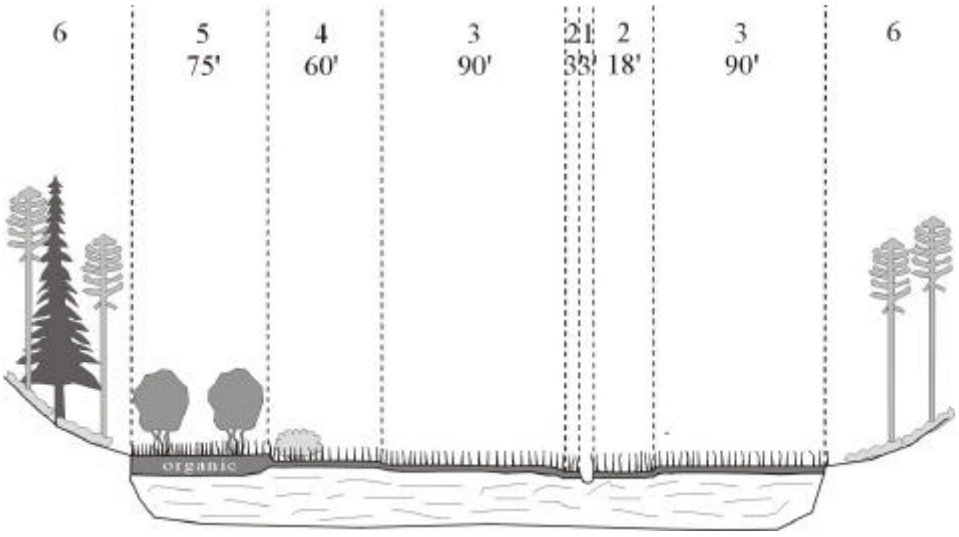
Vegetation types adjacent to sites sampled are:
terraces: Shrubby cinquefoil/Kentucky bluegrass, Ponderosa pine/Kentucky bluegrass;
sideslopes: ponderosa pine/bitterbrush/Geyer's sedge, ponderosa pine/elk sedge, Douglas fir/elk sedge, grand fir/pinegrass and subalpine fir/grouse huckleberry.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997
Washington: Kovalchik 2001

Illustrations

1. E5 stream reach
2. **Aquatic sedge**, wet meadow-floodplain
3. **Bladder sedge**, wet meadow-floodplain
4. **Undergreen willow/bladder sedge**, wet meadow
5. **Mountain alder/bladder sedge**, wet meadow
6. Lodgepole pine-(subalpine fir)/grouse huckleberry, northwest- and southeast-facing sideslopes



Lake Creek, North Fork John Day RD, Umatilla NF; very low gradient, mod. high elevation, flat-shaped valley

Alnus incana/Athyrium filix-femina Association

Mountain alder/Ladyfern Association
12 plots - CEGL002628

Ecoregional Range

BM, EC

Environment and Soils

This association is similar to the Sitka alder (*Alnus viridus* spp. *sinuata*)/Ladyfern Association but is found at lower elevations. It also extends farther south in the Blue Mountains than the Sitka alder/Ladyfern Association. Valleys are narrow and generally V-shaped but can occasionally be wide and flat. Valley gradients are generally below 3% but can range up to 20% in V-shaped valleys. Fluvial surfaces on which this type occurs are floodplains, streambanks springs, and wet valley bottoms. Rosgen stream reach types adjacent to sites sampled are B3, B4, B5, A3 and A4, and in two lower gradient valleys, C3 and E6. Cobble and gravel bedloads are predominant. Streams are usually 0.5-5 m wide with debris affecting 10-30% of the active channel. Soils are Endoaqepts, Humaquepts, and Endoaquolls. Textures are silt loam to sandy loam that grade into water-worked cobbles and gravel at the level of the old streambed. The soil remains relatively wet throughout the growing season. Sites are often flooded during peak runoff.

Vegetation Composition

Mountain alder forms a dense canopy, averaging 6.5 m (ranging from 2 to 15 m) over a rich mixture of mesic forbs. Lady fern is generally abundant and averages 83 cm tall. Stinking and prickly currant and thimbleberry are scattered through the shrub understory, averaging 1.2 m in height (ranging from 0.6-1.8 m). Drooping woodreed is the dominant graminoid. The herbaceous layer ranges from 46 to 107 cm in height. Herbaceous biomass averages 967 lbs/acre (ranging from 133-1967 lbs./acre).

Valley Environment	Average	Range
Elevation (ft)	4345	3425-6820
Plot Slope (%)	5	0.5-20
Valley Width (m)	25	5-65
Valley Gradient (%)	7	2-20
Valley Sideslopes (%)	42	15-70
Soil Surface Cover (%)		
Submerged	4	0-20
Bare Ground	2	0-10
Gravel	1	0-5
Rock	tr	0-5
Moss	55	2-89
Liverwort	1	0-6
Lichen	tr	0-1
Litter	36	4-93

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt, andesite, diorite, mixed sedimentary, mixed alluvium
Water Table Depth (cm)	avg: 36 (range: 15-56)
Depth to Wet Soil (cm)	avg: 8 (range: 0-33)
Total Rooting Depth (cm)	avg: 24 (range: 5-33)
Depth to Redoximorphic Features (cm)	avg: 28 (range: 13-46)
Thickness of Surface Organic Layer (cm)	avg: 22 (range: 5-40)
Depth to 80% Coarse Fragments (cm)	avg: 26 (range: 5-46)
Surface Layer	
Thickness (cm)	0-33
Texture(s)	organic loam, silt loam, loam, fine to medium sandy loam
Coarse Fragments (%)	0
Roots	very fine: many fine: common to many medium: none to few coarse: none to many
Redoximorphic Features	some iron concentrations
Subsurface Layer(s)	
Thickness (cm)	0-43+
Texture(s)	sapric organic, organic loam, silt loam, very fine to medium sandy loam, gravelly loam
Coarse Fragments (%)	0-95, gravel or cobble
Roots	very fine: many fine: few to many medium: none to few coarse: none to few
Redoximorphic Features	20-50% iron concentrations, some gleying
Substrate	sand, gravel, cobble

Adjacent Vegetation

Vegetation types adjacent to sites sampled are: floodplains: grand fir/ladyfern;
terraces: grand fir/Rocky Mountain maple floodplain,;
sideslopes: grand fir/queen's cup beadlily, grand fir/Pacific yew/queen's cup beadlily, grand fir/big huckleberry and grand fir/Rocky Mountain maple.

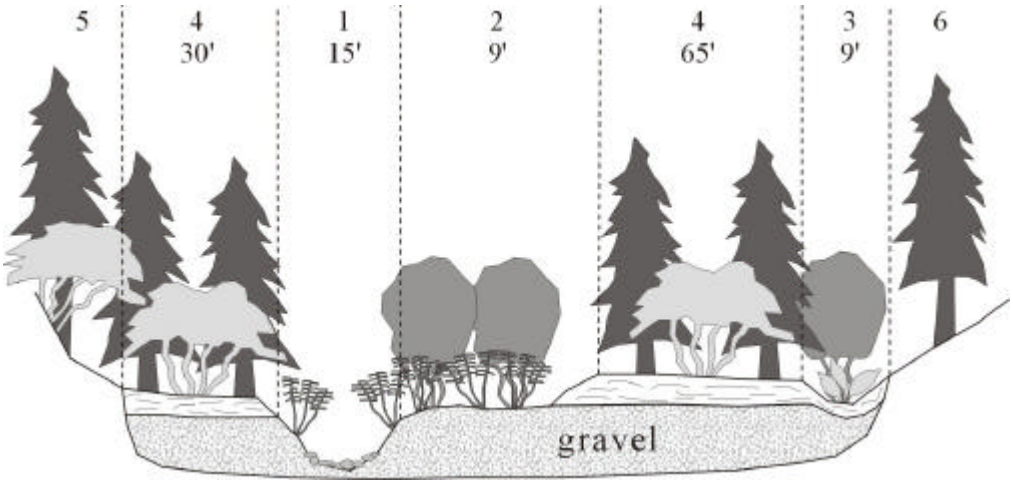
Nearby Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997
Washington: Kovalchik 2001

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
UNDERSTORY TREES			
Grand fir (*Abies grandis*)	42	2.5	tr-5
Engelmann spruce (*Picea engelmannii*)	42	1.4	1-2
SHRUBS			
Mountain alder (*Alnus incana*)	100	52	10-95
Prickly currant (*Ribes lacustre*)	75	5	tr-12
Common snowberry (*Symphoricarpos albus*)	67	3	1-7
Thimbleberry (*Rubus parviflorus*)	67	3	tr-9
Stinking swamp currant (*Ribes hudsonianum*)	58	17	tr-40
Red-osier dogwood (*Cornus sericea*)	58	8	tr-40
SEDGES and RUSHES			
Dewey's sedge (*Carex deweyana*)	58	3	tr-7
PERENNIAL GRASSES			
Drooping woodreed (*Cinna latifolia*)	83	19	tr-75
Tall mannagrass (*Glyceria striata*)	75	4	1-10
PERENNIAL FORBS			
Enchanter's nightshade (*Circaea alpina*)	100	6	tr-30
Sweet-scented bedstraw (*Galium triflorum*)	92	4	tr-15
Large-leaf avens (*Geum macrophyllum*)	75	3	tr-15
American speedwell (*Veronica americana*)	75	2	tr-5
Alpine mitrewort (*Mitella pentandra*)	67	13	tr-50
Hairy willow-herb (*Epilobium ciliatum*)	67	2	tr-5
Starry false Solomon's seal (*Maiathemum stellata*)	67	2	tr-5
Heart-leaved miner's lettuce (*Claytonia cordifolia*)	58	6	tr-15
Claspleaf twistedstalk (*Streptopus amplexifolius*)	58	2	1-5
Pathfinder (*Adenocaulon bicolor*)	58	2	tr-4
FERNS and HORSETAILS			
Ladyfern (*Athyrium filix-femina*)	100	28	8-75

Illustrations

1. B3 stream reach
2. **Mountain alder-currants/mesic forb**, banks and floodplain
3. **Mountain alder/ladyfern**, overflow channel
4. **Grand fir/Rocky Mtn. maple-floodplain**, terrace
5. **Grand fir/Rocky Mtn. maple**, east-facing toeslope
6. Grand fir, west-facing toeslope



Pearson Creek, North Fork John Day RD, Umatilla NF; mod. low gradient, mod. low elevation, flat-shaped valley

Alnus incana/Equisetum arvense Association

Mountain alder/Common horsetail Association
7 plots. CEGL001146

Ecoregional Range
BM, BR, EC?

Environment and Soils
The Mountain alder/common horsetail association was sampled at moderate elevations in the Blue Mountains and the Basin and Range Ecoregions. Valleys in are V-, box or trough-shaped and have moderate to high gradients. Fluvial surfaces on which this type is found are streambanks, alluvial bars, and floodplains. Adjacent Rosgen stream reach types are A3; B2, B3, B4, C2, C3 and E5.

Valley Environment	Average	Range
Elevation (ft)	4280	3560-5620
Plot Slope (%)	4	1-10
Valley Width (m)	44	5-65
Valley Gradient (%)	5	2-10
Valley Sideslopes (%)	51	15-70
Soil Surface Cover (%)		
Submerged	7	0-18
Bare Ground	15	0-75
Gravel	5	0-25
Rock	10	0-50
Moss	13	0-40
Liverwort	10	0-60
Litter	42	4-78

Soils are shallow, skeletal, mineral alluvium over water-worked gravel and cobbles that remains wet throughout the growing season.

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt, diorite, sedimentary
Water Table Depth (cm)	avg: 22.5 (range: 20-25)
Total Rooting Depth (cm)	avg: 42 (range: 20-63)
Surface Layer	
Thickness (cm)	4-8
Texture(s)	organic loam, silt loam, gravelly sand
Coarse Fragments (%)	0-60, gravel
Roots	very fine: few to many fine: few to many medium: none coarse: few to common
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	0-36+
Texture(s)	loamy sand
Coarse Fragments (%)	20, gravel
Roots	very fine: none to many fine: few to many medium: none coarse: none to common
Redoximorphic Features	none
Substrate	sand, gravel, cobble

Vegetation Composition

Mountain alder forms a dense canopy, averaging 2.5 m in height (ranging from 2-4 m) over a rich ground cover of wet site herbs. Shrubs such as red-osier dogwood, golden currant, and common snowberry may be scattered through the shrub understory. Common horsetail, smallwing sedge, tall mannagrass, and yellow monkeyflower are the most common species in the herbaceous layer, which averages 41 cm in height (ranging from 31-61 cm). The herbaceous composition on streambanks may be determined in part by which species first colonized the site (Kovalchik 1987). Herbaceous biomass averages 1232 lbs/acre (ranging from 1167-1266 lbs/acre).

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
UNDERSTORY TREES			
Grand fir (*Abies grandis*)	29	4	2-6
Engelmann spruce (*Picea engelmannii*)	29	tr	--
SHRUBS			
Mountain alder (*Alnus incana*)	100	57	20-80
Red-osier dogwood (*Cornus sericea*)	43	4	3-7
Golden currant (*Ribes aureum*)	43	2	tr-3
Common snowberry (*Symphoricarpos albus*)	43	2	tr-5
SEDGES and RUSHES			
Smallwing sedge (*Carex microptera*)	72	2	tr-5
Swordleaf rush (*Juncus ensifolius*)	43	3	tr-4
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	57	28	tr-75
Kentucky bluegrass (*Poa pratensis*)	57	3	tr-8
Blue wildrye (*Elymus glaucus*)	43	11	tr-30
Common timothy (*Phleum pratense*)	43	tr	--
PERENNIAL FORBS			
Yellow monkeyflower (*Mimulus guttatus*)	86	1	tr-2
Field mint (*Mentha arvensis*)	57	8	1-25
Large-leaf avens (*Geum macrophyllum*)	57	2	tr-3
Woods strawberry (*Fragaria vesca*)	57	1	tr-1
Yarrow (*Achillea millefolium*)	57	tr	1-9
Sweet-scented bedstraw (*Galium triflorum*)	43	4	tr-10
Stream violet (*Viola glabella*)	43	4	tr-3
Common cowparsnip (*Heracleum maximum*)	43	2	tr-1
Dandelion (*Taraxacum officinale*)	43	1	--
Hairy willow-herb (*Epilobium ciliatum*)	43	tr	--
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	100	36	13-90
Common scouring rush (*Equisetum hyemale*)	57	tr	--

Adjacent Vegetation

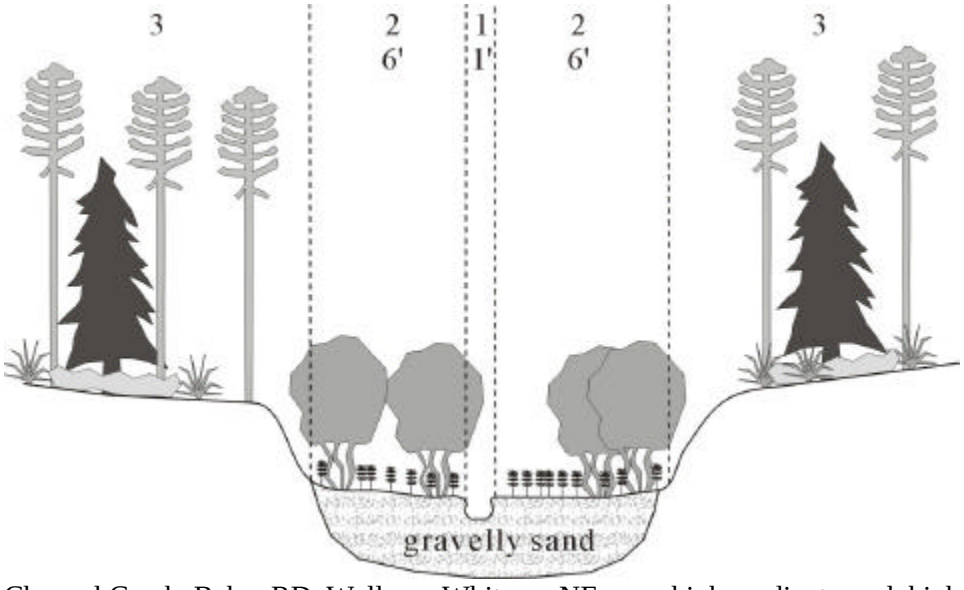
Vegetation types adjacent to sites sampled are:
terraces -Ponderosa pine/Kentucky bluegrass, black cottonwood/mountain alder-red-osier dogwood;
sideslopes -Lodgepole pine/grouse huckleberry, grand fir/pinegrass, other grand fir associations and other ponderosa pine associations, the latter occuring on upper slopes.

Nearby Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997
Washington: Kovalchik 2001
Colorado: Kittel *et al.* 1999
Utah and southeastern Idaho: Padgett *et al.* 1989

Illustrations

1. A5 stream reach
2. **Mountain alder/common horsetail**, floodplain
3. Lodgepole pine/grouse huckleberry/pinegrass, north- and south-facing sideslopes



Channel Creek, Baker RD, Wallowa-Whitman NF; very high gradient, mod. high elevation, trough-shaped valley; Mesic Forest Province 1.

Alnus incana/Glyceria striata Association

Mountain alder/Tall mannagrass Association
14 plots. CEGL000228.

Ecoregional Range

BM, EC

Environment and Soils

The *Alnus incana/Glyceria striata* association is found at moderate elevations throughout the Blue Mountains Ecoregion and less commonly in the East Cascades Ecoregion. Valleys range from very narrow to very wide and are V- or trough-shaped with gradients ranging from moderate to high. Fluvial geomorphic surfaces are floodplains, streambanks and springs. Sites are generally depositional areas that accumulate fine-textured sediments during high streamflow or as input from constant spring flow. Rosgen stream reach types are generally steep: A3, A4, A5, B2, B3, and B4. Soils are Endoaqents, Borosaprists, and Endoaquolls. Soils are deep, fine-textured mineral or organic material that remains moist to wet within the rooting zone throughout the growing season. Estimated water holding capacity is moderate to high.

Valley Environment	Average	Range
Elevation (ft)	4511	3820-5675
Plot Slope (%)	8	1-45
Valley Width (m)	105	5-350
Valley Gradient (%)	4	2-10
Valley Sideslopes (%)	40	15-70
Soil Surface Cover (%)		
Submerged	8	0-30
Bare Ground	11	0-52
Gravel	1	0-7
Rock	4	0-20
Moss	29	0-85
Liverwort	6	0-65
Litter	45	tr-100

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt, andesite, glacial moraines, mixed alluvium
Water Table Depth (cm)	avg: 36 (range: 20-76)
Total Rooting Depth (cm)	avg: 23 (range: 15-30)
Depth to Redoximorphic Features (cm)	avg: 3 (range: 0-8)
Depth to 30% Coarse Fragments (cm)	avg: 22 (range: 0-61)
Depth to 80% Coarse Fragments (cm)	avg: 34 (range: 0-64)
Surface Layer	
Thickness (cm)	1-23
Texture(s)	very fine to medium sandy loam, silt loam, hemic, fibric organic
Coarse Fragments (%)	0-10, gravel
Roots	very fine: many fine: many medium: none to many coarse: few to many
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	0-54
Texture(s)	very fine to fine sandy loam, silt loam, sapric, hemic organic
Coarse Fragments (%)	0-60, gravel, some cobble
Roots	very fine: few to many fine: none to many medium: none to few coarse: none to few
Redoximorphic Features	some iron concentration, reduction
Substrate	sand, gravel, cobble

Vegetation Composition

Mountain alder forms a dense canopy, averaging 3.6 m in height over tall mannagrass and a mixture of wet forbs. Stinking currant and/or prickly currant are often scattered throughout the shrub understory, averaging 1 m in height (ranging from 0.6 to 1.8 m). The forb layer includes large-leaf avens, sweet-scented bedstraw, American speedwell, enchanter's nightshade, musk monkeyflower, and monkshood. The herbaceous layer averages 57 cm in height, ranging from 31-91 cm. Herbaceous biomass averages 691 lbs/acre, ranging from 100-1467 lbs./acre.

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are:
terraces -grand fir/twinflower, grand fir/common snowberry, Douglas fir/common snowberry, ponderosa pine/common snowberry;
sideslopes - grand fir/grouse huckleberry-twinflower, grand fir/big huckleberry, grand fir/queen's cup beadlily, grand fir/Rocky Mountain maple, grand fir/ common snowberry, grand fir/pinegrass, grand fir/Columbia brome and Douglas-fir/common snowberry.

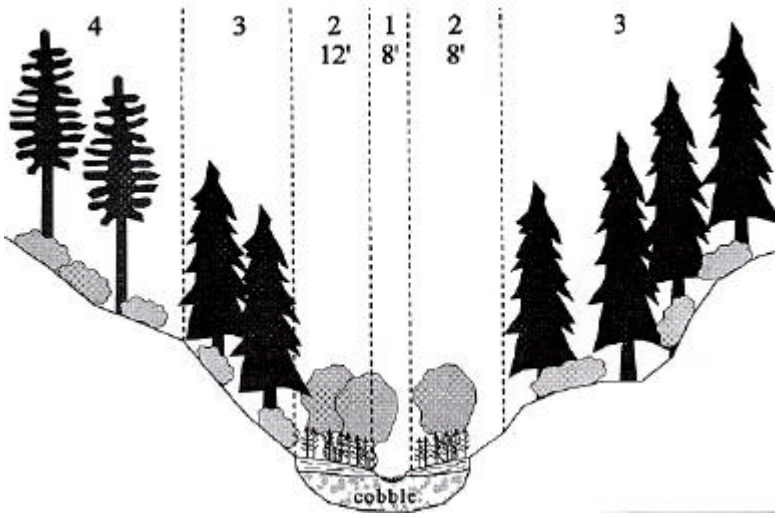
Nearby Studies Documenting Association with Plot Data

Oregon - Crowe and Clausnitzer 1997; Kovalchik (1987) described a Mountain Alder Springs Association that includes Mountain alder/Tall manngrass sites
Washington: - Kovalchik 2001
Utah and southeastern Idaho - Padgett *et al.* (1989) described a Mountain alder/Mesic Graminoid Community Type that includes Mountain alder/Tall manngrass sites

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Mountain alder (*Alnus incana*)	100	60	15-100
Stinking swamp currant (*Ribes hudsonianum*)	79	17	tr-70
Prickly currant (*Ribes lacustre*)	50	7	1-15
SEDGES and RUSHES			
Small-fruit bulrush (*Scirpus microcarpus*)	36	6	1-26
Swordleaf rush (*Juncus ensifolius*)	36	3	tr-8
Dewey's sedge (*Carex deweyana*)	36	1	tr-2
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	100	28	6-85
Drooping woodreed (*Cinna latifolia*)	36	4	1-10
PERENNIAL FORBS			
Large-leaf avens (*Geum macrophyllum*)	100	2	tr-6
Sweet-scented bedstraw (*Galium triflorum*)	72	4	tr-20
American speedwell (*Veronica americana*)	57	4	tr-15
Columbia monkshood (*Aconitum columbianum*)	57	2	tr-5
Enchanter's nightshade (*Circaea alpina*)	50	6	2-15
Musk monkeyflower (*Mimulus moschatus*)	50	2	tr-6
FERNS and ALLIES			
Common horsetail (*Equisetum arvense*)	50	14	tr-70

Illustrations

1. B3 stream reach
2. **Mountain alder/tall mannagrass**, floodplain
3. Grand fir/common snowberry, south-facing toeslope and north-facing sideslope
4. Douglas-fir/common snowberry, south-facing sideslope



Snow Fork, Pine RD, Wallowa-Whitman NF; high gradient, mod. low elevation, V-shaped valley

*Alnus incana/Gymnocarpium dryopteris Association**

Mountain alder/Oakfern Association
2 plots. New type

Valley Environment	Average	Range
Elevation (ft)	3505	3360-3650
Plot Slope (%)	4.5	4-5
Valley Width (m)	43	20-65
Valley Gradient (%)	7	--
Valley Sideslopes (%)	45	--
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	-	-
Gravel	-	-
Rock	5	0-10
Moss	27	20-34
Lichen	1.5	1-1
Litter	67	65-68

Ecoregional Range
BM

Environment and Soils
The mountain alder/oakfern community type was sampled on Pomeroy Ranger District (Umatilla National Forest) on narrow floodplains in moderately narrow, high gradient, V-shaped valleys adjacent to A2 and B3 Rosgen stream types. Streams were about 3-4 m wide with woody debris affecting 10-30% of the active channel.

Vegetation Composition
Mountain alder forms a dense shrub overstory, ranging in height from 3.7-6.5 m. The herbaceous layer of oakfern and other wet site forbs averages 25 cm in height, ranging from 20-31 cm. Herbaceous biomass averages 1088 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
UNDERSTORY TREES			
Douglas fir (*Pseudotsuga menziesii*)	100	5	4-6
Engelmann spruce (*Picea engelmannii*)	100	2	--
Grand fir (*Abies grandis*)	50	15	--
SHRUBS			
Mountain alder (*Alnus incana*)	100	83	80-85
Prickly currant (*Ribes lacustre*)	100	10	6-13
Thimbleberry (*Rubus parviflorus*)	50	9	--
Stinking swamp currant (*Ribes hudsonianum*)	50	4	--
PERENNIAL GRASSES			
Columbia brome (*Bromus vulgaris*)	50	6	--
PERENNIAL FORBS			
Sitka valerian (*Valeriana sitchensis*)	100	31	2-60
Stream violet (*Viola glabella*)	100	30	1-60
Enchanter's nightshade (*Circaea alpina*)	100	21	1-40
False bugbane (*Trautvettaria caroliniensis*)	100	13	1-25
Oneleaf foamflower (*Tiarella trifoliata* var. *unifoliata*)	100	6	5-6
Starry false Solomon's seal (*Maianthemum stellata*)	100	4	3-5
Heart-leaved miner's lettuce (*Claytonia cordifolia*)	100	2	--
Sweet-scented bedstraw (*Galium triflorum*)	100	1	--
Mountain sweet cicily (*Osmorhiza berteroi*)	100	1	tr-1
Large-leaf avens (*Geum macrophyllum*)	100	1	tr-1
FERNS and HORSETAILS			
Oakfern (*Gymnocarpium dryopteris*)	100	18	15-20
Ladyfern (*Athyrium filix-femina*)	100	2	--

Adjacent Vegetation
Generally this community is adjacent to a grand fir/oakfern terrace.

Nearby Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997
Washington: Kovalchik 2001

Alnus incana/Heracleum maximum Association

Mountain alder/Common cowparsnip Association
10 plots. New type

Ecoregional Range
BM

Environment and Soils
The Alnus incana/Heracleum maximum Association was sampled at moderate to high elevations throughout the Blue Mountains Ecoregion. Valleys are U-, V-, or trough-shaped, and moderately wide to wide with low to very high gradients and gentle to steep side slopes. Adjacent Rosgen stream reach types were A3, B2, B3, B5 and C3 with 2-10 m wide channels and woody debris affecting 10-30% of the active channel. Depth to the buried stream bed varies from 15-25 cm.

Valley Environment	Average	Range
Elevation (ft)	4510	3000-7560
Plot Slope (%)	10	1-40
Valley Width (m)	88	65-200
Valley Gradient (%)	11	1-40
Valley Sideslopes (%)	53	15-70
Soil Characteristics		
Water Table Depth (cm)	42	33-50
Depth to 30% Coarse Fragments (cm)	10	0-25
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	16	0-50
Gravel	3	0-10
Rock	6	0-35
Cryptogam	7	0-25
Litter	67	25-98

Vegetation Composition
Shrub overstory averages 6 m (ranging from 2.5-9.2 m). Red-osier dogwood (*Cornus sericea*), Thimbleberry (*Rubus parviflorus*) and various currants (*Ribes*) may be scattered through the shrub understory, which averages 0.6 m. The herbaceous layer, which is dominated by common cowparsnip, sweet-scented bedstraw, tall mannagrass, stinging nettle, averages 80 cm (ranging from 45-122 cm). Herbaceous biomass averages 1108 lbs/acre, ranging from 666-1966 lbs/acre).

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Mountain alder (*Alnus incana*)	100	73	37-100
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	50	5	2-8
Kentucky bluegrass (*Poa pratensis*)	50	4	2-6
Blue wildrye (*Elymus glaucus*)	50	4	1-8
PERENNIAL FORBS			
Common cowparsnip (*Heracleum maximum*)	100	16	3-45
Sweet-scented bedstraw (*Galium triflorum*)	80	6	tr-20
Stinging nettle (*Urtica dioica*)	80	6	tr-15
Large-leaf avens (*Geum macrophyllum*)	70	2	tr-4
Starry false Solomon's seal (*Maianthemum stellata*)	60	12	tr-30
Mountain sweet cicily (*Osmorhiza beteroi*)	50	4	tr-10
Field mint (*Mentha arvensis*)	50	2	tr-5
Enchanter's nightshade (*Circaea alpina*)	40	11	tr-35
Arrowleaf groundsel (*Senecio triangularis*)	40	5	tr-15
Curly dock (*Rumex crispus*)	40	2	tr-4
Yarrow (*Achillea millefolium*)	40	1	tr-1
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	50	3	tr-4

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
terraces -Grand fir/Rocky Mountain maple, other grand fir associations and lodgepole pine (*Pinus contorta*) associations.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997

Alnus incana/Mesic Forbs Association

Mountain alder/Mesic Forbs Association
19 plots. CEGL001147

Valley Environment	Average	Range
Elevation (ft)	4681	2810-6300
Plot Slope (%)	12	1-50
Valley Width (m)	118	20-350
Valley Gradient (%)	13	2-50
Valley Sideslopes (%)	47	15-70
Soil Characteristics		
Water Table Depth (cm)	29	20-46
Soil Surface Cover (%)		
Submerged	tr	0-3
Bare Ground	13	0-50
Gravel	4	0-15
Rock	12	0-75
Bedrock	tr	0-1
Cryptogam	22	0-98
Litter	50	0-94

Ecoregional Range

BM, BR, EC

Environment and Soils

The Alnus incana/Mesic Forbs Association is common throughout the Blue Mountains and East Cascades Ecoregions. Sites were also sampled in the High Lava Plains section of the Blue Mountains and the Basin and Range Ecoregions. Valleys are V-, trough-, flat- and box-shaped and range from narrow to very wide with moderate to very high gradients. Sideslopes are gentle to steep. Thus, this association occurs in a wide range of valley types. Fluvial surfaces are streambanks, floodplains and occasionally springs. Adjacent Rosgen stream reach types are A3, B3, B4, C3, and E6. Channels are 2 to 10 m wide.

Vegetation Composition

On all but two sampled plots, the mountain alder canopy is very dense, excluding the establishment of other shrubs and herbaceous indicator species. Mountain alder canopy height averages 4 m (ranging from 2-8 m). The sparse herbaceous layer averages 55 cm (ranging from 20-84 cm). Herbaceous biomass averages 780 lbs/acre, ranging from 200-1300 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Mountain alder (*Alnus incana*)	100	66	15-98
SEDGES and RUSHES			
Small-fruit bulrush (*Scirpus microcarpus*)	39	1	tr-3
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	47	8	tr-50
Blue wildrye (*Elymus glaucus*)	47	4	tr-13
Tall mannagrass (*Glyceria striata*)	42	4	tr-15
PERENNIAL FORBS			
Yellow monkeyflower (*Mimulus guttatus*)	53	6	tr-37
Hairy willow-herb (*Epilobium ciliatum*)	53	1	tr-5
Yarrow (*Achillea millefolium*)	53	1	tr-1
Sweet-scented bedstraw (*Galium triflorum*)	47	3	tr-5
Starry false Solomon's seal (*Maiathemum stellata*)	42	13	tr-90

Adjacent Vegetation

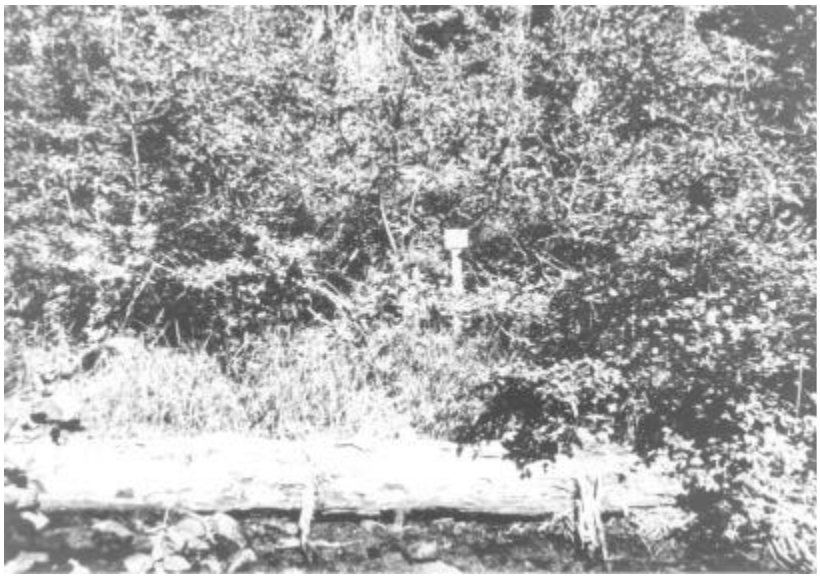
Little data are available on the upland vegetation zones in which this association occurs. This association probably occurs adjacent to Ponderosa pine (*Pinus ponderosa*), Grand fir (*Abies grandis*), Lodgepole pine (*Pinus contorta*), and Douglas fir (*Pseudotsuga menziesii*) associations.

Other Studies Documenting Association with Plot Data

Oregon: Kovalchik (1987) described a Mountain alder Association that includes Mountain alder/Mesic Forbs sites; Crowe and Clausnitzer 1997
Washington: Kovalchik 2001
Nevada: Manning and Padgett 1995
Colorado: Kittel *et al.* 1999

Alnus incana-Spiraea douglasii Association

Mountain alder-Douglas' spiraea Association
11 plots. CEGL001152



Ecoregional Range
BM, BR, EC

Environment and Soils
This association often occurs in the Engelmann spruce-Lodgepole pine zone of the East Cascades and the western Blue Mountains Ecoregions. Elevations of sampled sites range from 2200 feet at Squaw Creek (Ochoco National Forest) to 5700 feet in the Cascades. It occurs on active fluvial surfaces within several landforms: 1) moderate to steep gradient floodplains in the higher elevations of the East Cascades, 2) moderate gradient floodplains in lower elevations of the East Cascades northwest of Bend, where the adjacent inactive floodplains are dominated by ponderosa pine/common snowberry, 3) narrow, deeply incised, moderate gradient drainages in the pumice-mantled areas of the eastern Winema and western Fremont National Forests and surrounding areas, and 4) the banks of large streams in deep, V-shaped canyons such as Squaw Creek and the Deschutes River Canyons in the Crooked River National Grassland, the Metolius River in the low elevation East Cascades, and Sprague River Canyon in the Basin and Range Ecoregion.

Valley Environment	Average	Range
Elevation (ft)	4203	2250-5640
Plot Slope (%)	23	1-60
Valley Gradient (%)	22	1-60
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	11	0-20
Gravel	3	0-15
Rock	8	0-50
Cryptogam	6	0-15
Litter	73	20-100

Soils are well aerated alluvium. Surface soil textures are loam to sandy loam, grading into water-worked cobbles and gravels at the level of the old streambed. Available water holding capacity is low but the soil remains moist season long due the proximity of water. The site is often flooded during peak runoff and the water table is within 1 m of the soil surface in late summer.

Vegetation Composition
The association is dominated by mountain alder and Douglas spiraea. Dogwood, woods rose, willows, and prickly currant are scattered through the shrub layer. Pacific ninebark and vine maple are often codominant with alder in the vicinity of Santiam Pass (Deschutes National Forest). The site is capable of growing several species of willow but their seedlings rarely reach maturity because of browsing by deer, elk, beaver, and livestock. Widefruit or softleaved sedge are found on most plots in the Cascade Mountains. Bluejoint reedgrass, tall mannagrass, and blue wildrye are common grasses. A rich mesic forb component usually dominates the graminoids and includes yarrow, monkshood, common horsetail, sweetscented bedstraw, arrowleaf groundsel, starry solomon plume, and Jacob's ladder.

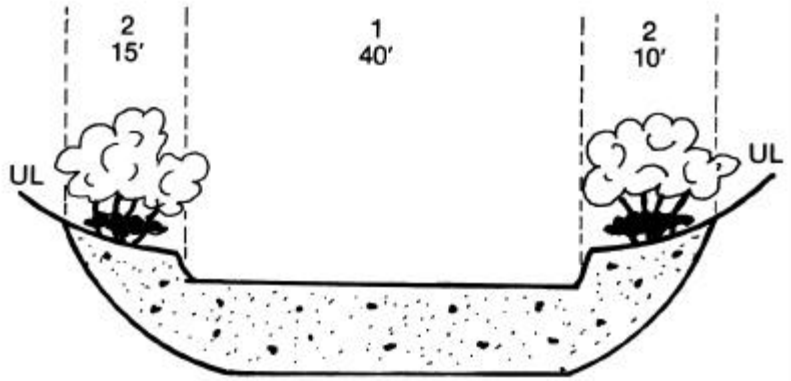
Successional Dynamics
With overuse by livestock, the alder canopy becomes disrupted and clumpy. Alder decreases in vigor as indicated by dead shrubs, highlining, and lack of younger age classes. Grazing and trampling reduce the competitive ability of Douglas spiraea in favor of Kentucky bluegrass and forbs. The stream channel becomes wider and shallower due to accelerated erosion. With continued overuse, grazing and trampling eliminate both alder and spiraea. Grasses and forbs dominate the site. The stream channel is wide and shallow. Most of the streambanks will be eroded because of the absence of alder.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-SUBDOMINANTS			
Engelmann spruce (*Picea engelmannii*)	36	7	3-15
Lodgepole pine (*Pinus contorta*)	27	9	5-15
TREE UNDERSTORY			
Engelmann spruce (*Picea engelmannii*)	27	2	1-2
Lodgepole pine (*Pinus contorta*)	27	1	1-2
SHRUBS			
Mountain alder (*Alnus incana*)	100	47	35-70
Douglas' spiraea (*Spiraea douglasii*)	100	19	10-37
Wood's rose (*Rosa woodsii*)	73	4	1-5
Prickly currant (*Ribes lacustre*)	64	5	1-10
Red-osier dogwood (*Cornus sericea*)	55	10	2-15
SEDGES and RUSHES			
Widefruit sedge (*Carex angustata*)	46	12	3-20
Soft-leaved sedge (*Carex disperma*)	46	6	tr-15
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	55	3	tr-5
PERENNIAL FORBS			
Starry false Solomon's seal (*Maiathemum stellata*)	91	5	tr-15
Sweet-scented bedstraw (*Galium triflorum*)	64	3	tr-5
Fireweed (*Epilobium angustifolium*)	64	1	tr-5
Yarrow (*Achillea millefolium*)	64	1	tr-5
Arrowleaf groundsel (*Senecio triangularis*)	55	3	tr-5
Columbia monkshood (*Aconitum columbianum*)	46	4	tr-5
American vetch (*Vicia americana*)	46	2	tr-5
Pink wintergreen (*Pyrola asarifolia*)	46	1	tr-2
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	55	5	tr-15

Other Studies Documenting Association with Plot Data

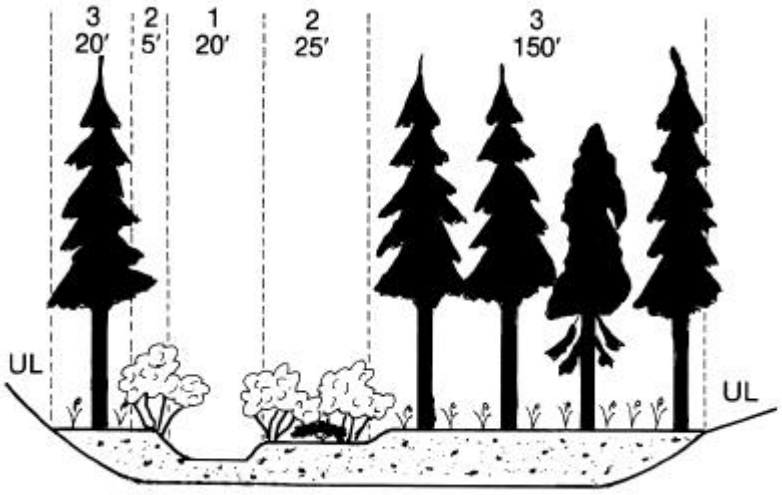
Washington: Kovalchik 2001

Illustrations



1. Metolius River, forth order
2. **Mountain alder-Douglas spiraea**, banks

Metolius River; mod gradient, low elevation canyon; Low Flanks Cascades Physiographic Area.



1. Odell Creek, third order
2. **Mountain alder-Douglas spiraea**, banks and active channel shelves
3. **Engelmann spruce/queencup beadlily**, inactive floodplains

Odell Creek; mod gradient, mod elevation floodplains; Deschutes Cascades Physiographic Area.

Alnus incana-Ribes lacustre-Ribes hudsonianum Association

Mountain alder-prickly currant-stinking swamp currant Association
21 plots. CEGL001151

Ecoregional Range
BM, EC

Environment and Soils
The Mountain alder-prickly currant-stinking swamp currant Association occurs in higher cooler part of the grand fir, white fir and lodgepole pine zones in the East Cascades and Blue Mountains Ecoregions. This association occurs at moderate to moderately high elevations in generally narrow, V- (occasionally trough- or flat-) shaped valleys with moderate to high gradients. Fluvial surfaces are floodplains and streambanks and occasionally in springs. Soils are poorly developed Entisols (Endoaquents, Udifluvents, and Udorthents) and comprise shallow, gravelly silt loam to gravelly sand textured fluvial deposits. Sites are flooded most years in late winter or early spring. The water table drops through the growing season down to about 25-50 cm below the soil surface. Rosgen stream reach types adjacent to sample sites are fast-flowing A3, A4, B3, B4, and occasionally C4's. Streams are generally 2-5 m wide with large woody debris affecting 30-50% of the stream channel.

Vegetation Composition

Mountain alder is the shrub overstory (avg. 3.5 m tall, ranging from 2-7.5 m) with a shrub understory dominated by stinking and prickly currant (averaging 1.7 m tall, ranging from 0.3-2 m). Stinking currant is an obligate wetland species in this wet association and has greater cover than prickly currant, which is a facultative wetland species. Beneath the shrubs is a rich assemblage of moist and wet forbs comprising the herbaceous layer, which averages 46 cm in height, ranging from 10-91 cm. Tall mannagrass occurs on nearly all plots indicating the moist, shady microclimate of these sites. Herbaceous biomass averages 835 lbs/acre, ranging from 182-1735 lbs/acre.

Valley Environment	Average	Range
Elevation (ft)	5050	3800-5900
Plot Slope (%)	7	0.5-40
Valley Width (m)	31	5-65
Valley Gradient (%)	7	2-40
Valley Sideslopes (%)	43	15-45
Soil Characteristics		
Water Table Depth (cm)	36	20-65
Rooting Depth (cm)	25	13-46
Depth to 30% Coarse Fragments (cm)	14	0-33
Depth to 80% Coarse Fragments (cm)	20	0-46
Soil Surface Cover (%)		
Submerged	2	0-15
Bare Ground	9	0-75
Gravel	1	0-7
Rock	1	0-5
Bedrock	tr	0-3
Cryptogam	45	0-98
Litter	43	2-98

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
UNDERSTORY TREES			
Engelmann spruce (*Picea engelmannii*)	43	3	tr-4
Grand fir (*Abies grandis*)	33	2	tr-5
White fir (*Abies concolor*)	14	3	1-7
SHRUBS			
Mountain alder (*Alnus incana*)	100	55	20-90
Prickly currant (*Ribes lacustre*)	95	15	1-40
Stinking swamp currant (*Ribes hudsonianum*)	81	24	5-60
Common snowberry (*Symphoricarpos albus*)	33	7	2-20
SEDGES and RUSHES			
Soft-leaved sedge (*Carex disperma*)	43	6	1-30
Dewey's sedge (*Carex deweyana*)	38	2	tr-5
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	91	6	tr-36
Drooping woodreed (*Cinna latifolia*)	62	2	tr-7
PERENNIAL FORBS			
Sweet-scented bedstraw (*Galium triflorum*)	91	3	tr-5
Large-leaf avens (*Geum macrophyllum*)	81	3	tr-7
Alpine mitrewort (*Mitella pentandra*)	71	3	tr-10
Brook saxifrage (*Saxifraga odontoloma*)	67	9	1-41
Columbia monkshood (*Aconitum columbianum*)	67	3	tr-7
Enchanter's nightshade (*Circaea alpina*)	57	12	tr-55
Claspleaf twistedstalk (*Streptopus amplexifolius*)	52	4	tr-23
Arrowleaf groundsel (*Senecio triangularis*)	48	11	tr-33
Starry false Solomon's seal (*Maiathemum stellata*)	48	6	tr-37
Common cowparsnip (*Heracleum maximum*)	48	3	tr-15
Mountain sweet cicily (*Osmorhiza beteroi*)	48	2	tr-5
Musk monkeyflower (*Mimulus moschatus*)	48	1	tr-3

Successional Dynamics

If sites become drier through accumulation of sediments on sites or movement of the stream channel, this association may succeed to a grand fir association.

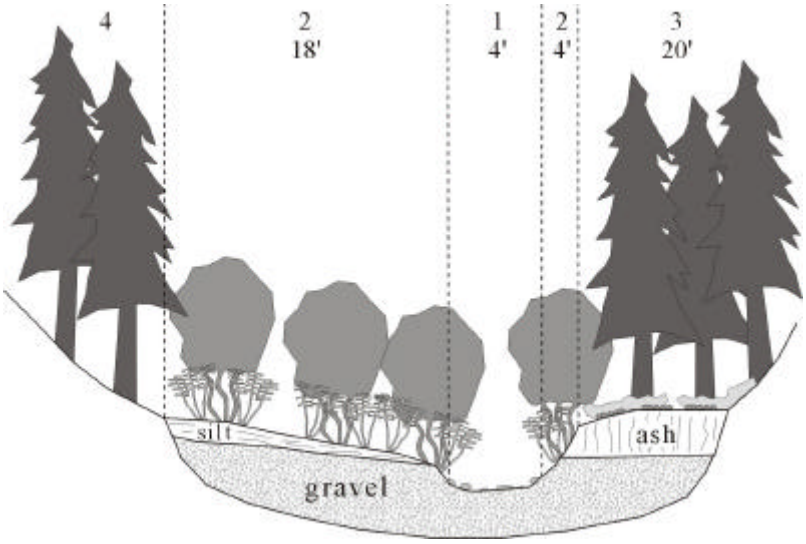
Adjacent Vegetation

Vegetation types adjacent to sites sampled are:
terraces - grand fir/Rocky Mountain maple, Grand fir/common snowberry, grand fir/twinflower, grand fir/queen's cup beadlily, and grand fir/grouse huckleberry-twinflower;
sideslopes - subalpine fir/twinflower, subapline fir/false bugbane, subalpine fir/big huckleberry, grand fir/twinflower, grand fir/pinegrass, grand fir/birchleaf spiraea, grand fir/big huckleberry, grand fir/queen's cup beadlily and other grand fir associations.

Nearby Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997
Washington: Kovalchik's (2001) Mountain alder/Mesic Forbs Association includes Mountain alder-Currants
Wyoming and eastern Idaho: Youngblood *et al.* 1985

Illustrations



Belshaw Creek, Long Creek RD, Malheur NF; mod. low gradient, mod. elevation, V-shaped valley

1.B4 stream reach
2.**Mountain alder-currants/mesic forb**, banks and floodplain
3.Grand fir/grouse huckleberry-twinflower, terrace
4.Grand fir, south-facing toeslope

Alnus incana-Cornus sericea ssp. sericea Association

Mountain alder-red-osier dogwood Association
28 plots. CEGL001145

Ecoregional Range
BM, BR, CB, EC

Environment and Soils
This association generally occurs in the lower, warmer part of grand fir and white fir zones of the Blue Mountains and East Cascades Ecoregions and probably in the higher, relatively cooler zones of the Basin and Range, Columbia Basin, and Blue Mountains Ecoregions. Valleys are generally narrow and V-shaped with moderate to very high gradients but can occasionally be broader and flat-, box-, or trough-shaped. Fluvial surfaces are floodplains, streambanks, or alluvial bars. Soils are Endoaquents, Psammaquents, Endoaquolls, Udifluvents and one Borosaprist. The soils can consist of skeletal or fine-textured material and sites are probably flooded most years in late winter or early spring. The water table drops through the growing season down to as much as 1 m below the soil surface. Rosgen stream reach types adjacent to this association are predominantly fast-flowing B2, B3, B4, streams, although this type also occurs adjacent to A3, C3 and F2 stream reach types.

Valley Environment	Average	Range
Elevation (ft)	3896	2325-5260
Plot Slope (%)	6	tr-60
Valley Width (m)	55	5-200
Valley Gradient (%)	7	2-6
Valley Sideslopes (%)	56	45-70
Soil Characteristics		
Water Table Depth (cm)	52	10-100
Rooting Depth (cm)	27	12-48
Depth to 20% Coarse Fragments (cm)	23	0-48
Depth to 80% Coarse Fragments (cm)	29	0-56
Soil Surface Cover (%)		
Submerged	4	0-30
Bare Ground	10	0-90
Gravel	5	0-54
Rock	8	0-30
Cryptogam	13	0-80
Litter	57	5-100

Vegetation Composition
Mountain alder is the shrub overstory (averaging 5.9 m tall, ranging from 2.5 to 9.2 m) with a shrub understory dominated by red-osier dogwood (averaging 1.9m tall, ranging from 0.9 to 4.6 m). Prickly currant, stinking currant, common snowberry and thimbleberry are also scattered through the shrub understory. The herbaceous layer includes large-leaf avens, sweet-scented bedstraw, stinging nettle, sharptooth angelica, enchanter's nightshade, tall mannagrass, blue wildrye, and Dewey's sedge and averages 54 cm, ranging from 31-122 cm. Herbaceous biomass averages 440 lbs/acre, ranging from 100 to 870 lbs/acre.

Adjacent Vegetation
Vegetation types adjacent to sites sampled are:
terraces: grand fir/Rocky Mountain maple-floodplain, grand fir/common snowberry, Engelmann spruce/drooping woodreed, ponderosa pine/Kentucky bluegrass;
sideslopes - grand fir/twinflower, grand fir/Rocky Mountain maple, grand fir/big huckleberry, grand fir/pinegrass, grand fir/grouse huckleberry-twinflower, grand fir/elk sedge, Douglas fir/bunchgrass and ponderosa pine/bunchgrass.

Successional Dynamics
If sites change to drier terraces or high floodplains through accumulation of sediments on sites or movement of the stream channel, this association may succeed to a grand fir association.

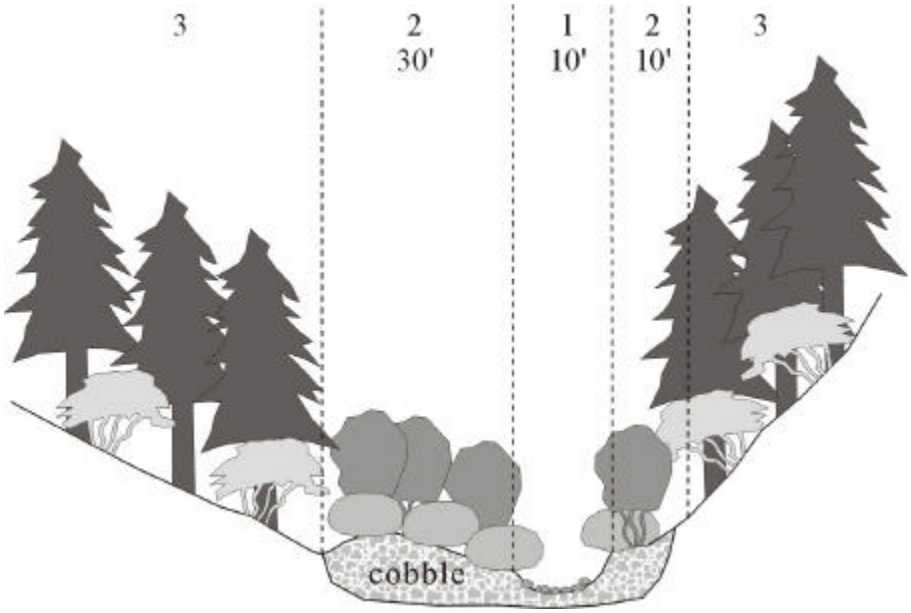
Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
UNDERSTORY TREES			
Grand fir (*Abies grandis*)	25	5	tr-10
SHRUBS			
Mountain alder (*Alnus incana*)	100	55	14-100
Red-osier dogwood (*Cornus sericea*)	100	38	11-90
Prickly currant (*Ribes lacustre*)	61	13	tr-50
Common snowberry (*Symphoricarpos albus*)	57	14	tr-40
Stinking swamp currant (*Ribes hudsonianum*)	43	5	tr-20
SEDGES and RUSHES			
Dewey's sedge (*Carex deweyana*)	32	13	tr-55
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	34	3	tr-15
Blue wildrye (*Elymus glaucus*)	39	2	tr-8
Drooping woodreed (*Cinna latifolia*)	32	6	tr-30
PERENNIAL FORBS			
Large-leaf avens (*Geum macrophyllum*)	61	2	tr-8
Stinging nettle (*Urtica dioica*)	54	2	tr-7
Sweet-scented bedstraw (*Galium triflorum*)	50	3	tr-9
Sharptooth angelica (*Angelica arguta*)	43	2	tr-4
Enchanter's nightshade (*Circaea alpina*)	39	10	tr-65
Mountain sweet cicily (*Osmorhiza berteroi*)	39	1	tr-5
Starry false Solomon's seal (*Maianthemum stellata*)	32	3	tr-15
Claspleaf twistedstalk (*Streptopus amplexifolius*)	32	2	tr-5
Woods strawberry (*Fragaria vesca*)	32	1	tr-5
FERNS and HORSETAILS			
Common scouring Rush (*Equisetum hyemale*)	36	3	tr-15

Nearby Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997; McNeil 1975: 85
Washington: Kovalchik 2001
Nevada: Manning and Padgett 1995
Idaho: Moseley 1998: 28
Colorado: Kittel *et al.* 1999

Illustrations

1. B3 stream reach
2. **Mountain alder-red-osier dogwood/mesic forb**, floodplain
3. **Grand fir/Rocky Mtn. maple**, east- and west-facing sideslopes



Touchet River, Pomeroy RD, Umatilla NF; mod. gradient, mod. low elevation, V-shaped valley.

Alnus incana-Physocarpus capitatus/Equisetum arvense-Elymus glaucus Association

Mountain alder-Pacific ninebark/Common horsetail-blue wildrye Association
10 plots. New type

Valley Environment	Average	Range
Elevation (ft)	2114	760-2740
Plot Slope (%)	8	1-60
Valley Width (m)	90	20-200
Valley Gradient (%)	8	2-60
Valley Sideslopes (%)	56	15-70
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	5	--
Gravel	-	-
Rock	20	--
Cryptogam	10	--
Litter	65	--

Ecoregional Range
BM, CB, EC?

Environment and Soils
The *Alnus incana-Physocarpus carpitatus/Equisetum arvense-Elymus glaucus* Association occurs at moderately low to low elevations, generally occurs in the Douglas fir zone, in the northern Blue Mountains, Columbia Basin and possibly the northern East Cascades Ecoregions. This association is somewhat similar to the Mountain alder-red-osier dogwood Association with Pacific ninebark seeming to take the place of red-osier dogwood at these lower elevations in the Columbia Basin, Blue Mountains and East Cascades where they receive the Maritime climatic influence from the Columbia River.

Valleys are box- and trough-shaped and moderately wide with low gradients and moderately steep to steep sideslopes. Adjacent Rosgen stream reach types are B3, C3, and C6.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SUBDOMINANT OVERSTORY TREES			
Douglas fir (*Pseudotsuga menziesii*)	40	4	3-7
UNDERSTORY TREES			
Douglas fir (*Pseudotsuga menziesii*)	40	tr	--
SHRUBS			
Mountain alder (*Alnus incana*)	100	41	15-63
Pacific ninebark (*Physocarpus capitatus*)	100	20	15-40
Common snowberry (*Symphoricarpos albus*)	90	6	3-15
Red-osier dogwood (*Cornus sericea*)	90	5	tr-15
Lewis' mockorange (*Philadelphus lewisii*)	70	10	tr-15
Serviceberry (*Amalanchier alnifolia*)	60	1	tr-3
Oceanspray (*Holodiscus discolor*)	50	12	tr-38
Wood's rose (*Rosa woodsii*)	50	3	3-5
Baldhip rose (*Rosa gymnocarpa*)	50	2	tr-3
Cascara (*Frangula purshiana*)	50	tr	--
Rocky Mountain maple (*Acer glabrum*)	40	12	3-15
Thimbleberry (*Rubus parviflorus*)	40	5	tr-15
Black hawthorn (*Crataegus douglasii*)	40	2	tr-3
Oregon boxwood (*Pachistima myrsinites*)	40	1	tr-2
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	70	1	tr-5
Nodding fescue *(Festuca subulata)*	50	2	tr-10
Tall mannagrass (*Glyceria striata*)	40	tr	--
PERENNIAL FORBS			
Common cowparsnip (*Heracleum maximum*)	50	4	tr-15
Siberian miners-lettuce (*Claytonia sibirica*)	50	1	tr-5
Western meadowrue (*Thalictrum alpinum*)	50	1	tr-3
Stinging nettle (*Urtica dioica*)	40	1	tr-3
Bitter dock (*Rumex obtusifolius*)	40	1	tr-3
Leafy aster (*Symphyotrichum foliaceum*)	40	1	tr-3
Columbia monkshood (*Aconitum columbianum*)	40	1	tr-3
Starry false Solomon's seal (*Maiathemum stellata*)	40	1	tr-3
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	80	3	tr-15
Swordfern (*Polystichum munitum*)	50	tr	--

Vegetation Composition
Mountain alder dominates the shrub overstory. Pacific ninebark is the shrub understory dominant with scattered common snowberry, red-osier dogwood, mockorange, serviceberry and oceanspray in various stands. Herbaceous species comprise common lower elevation warm sites species, including blue wildrye, nodding fescue, common cowparsnip, Siberian miner's lettuce, and western meadow rue.

Nearby Studies Documenting Association
none

Alnus incana-Symphoricarpos albus Association

Mountain alder-common snowberry Association
16 plots. CEGL001153

Ecoregional Range
BM, EC

Environment and Soils
This association occurs primarily in thin Ponderosa pine lower, warmer Grand fir and white fir zones at low to moderate elevations primarily in the Blue Mountains. It occurs occasionally in the East Cascades. Valleys are generally narrow and V- or flat-shaped with moderate to high gradients but can occasionally be broader and flat-shaped. Fluvial surfaces are well developed banks, overflow channels, channel shelves and floodplains. Streams are larger, second order and higher. Rosgen stream reach types of adjacent streams are A3, B2, B3, B4 and C4.

Valley Environment	Average	Range
Elevation (ft)	4108	2700-5400
Plot Slope (%)	7	0.1-40
Valley Width (m)	78	5-350
Valley Gradient (%)	7	1-40
Valley Sideslopes (%)	48	45-70
Soil Characteristics		
Water Table Depth (cm)	50	30-60
Rooting Depth (cm)	37	31-41
Depth to Redoximorphic Features (cm)	45	20-70
Depth to 30% Coarse Fragments (cm)	39	15-90
Depth to 80% Coarse Fragments (cm)	43	15-90
Soil Surface Cover (%)		
Submerged	11	0-98
Bare Ground	10	0-60
Gravel	1	0-10
Rock	2	0-15
Cryptogam	10	0-65
Litter	65	2-100

Soils are Entisols (mainly Aquents and Fluvents) consisting of well aerated silt loam, loam to loamy sand mineral materials that grade into water-worked cobbles and gravels at 15 to 90 cm deep over the old streambed. The soil surface may often be flooded during peak runoff. The water table drops to 70 cm or greater by the end of the growing season, but the high water-holding capacity of the soils allows them to remain moist.

Vegetation Composition
Mountain alder is the shrub overstory (avg. 4.8 m tall, ranging from 3.1 to 7.7 m) with a shrub understory dominated by common snowberry. Prickly currant, red-osier dogwood, bald-hip rose, and stinking currant are scattered through the shrub understory, which averages 1.7 m tall. Some sites are capable of growing several species of willow as well as aspen and cottonwood, but seedlings of these species rarely reach maturity because of browsing by deer, elk, beaver, and livestock. The herbaceous layer averages 65cm, ranging from 31 to 91 cm. Common grasses included blue wildrye and Kentucky bluegrass. Forbs include starry false Solomon's seal, Columbia monkshood, common cowparsnip, northern bedstraw and large-leaf avens. Herbaceous biomass averages 605 lbs/acre, ranging from 50 to 1333 lbs.acre.

Nearby Studies Documenting Association with Plot Data
Oregon: Kovalchik 1987: 69; Crowe and Clausnitzer 1997; Padgett 1981: 57; Kauffman 1982: 60
Washington: Kovalchik 2000

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Mountain alder (*Alnus incana*)	100	60	5-100
Common snowberry (*Symphoricarpos albus*)	100	38	5-80
Red-osier dogwood (*Cornus sericea*)	44	4	1-10
Wood's rose (*Rosa woodsii*)	44	4	1-5
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	69	7	tr-30
Kentucky bluegrass (*Poa pratensis*)	50	10	2-30
PERENNIAL FORBS			
Starry false Solomon's seal (*Maiathemum stellata*)	63	3	2-5
Columbia monkshood (*Aconitum columbianum*)	44	5	tr-25
Common cowparsnip (*Heracleum maximum*)	44	5	1-20
Northern bedstraw (*Galium boreale*)	44	2	--
Large-leaf avens (*Geum macrophyllum*)	44	1	tr-2

Adjacent Vegetation

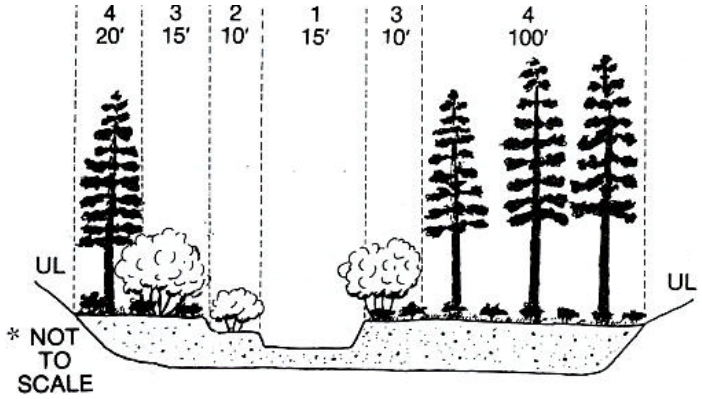
Vegetation types adjacent to sites sampled are:
terraces - black hawthorn, grand fir/Rocky Mountain maple-floodplain, grand fir/twinflower, Douglas-fir/common snowberry, ponderosa pine/common snowberry;
sideslopes - grand fir/queen's cup beadlily, grand fir/Rocky Mountain maple, Douglas-fir/common snowberry, Douglas fir/pinegrass, Douglas-fir/mallow ninebark, ponderosa pine/common snowberry and shinyleaf ceanothus-Scouler willow.

Successional Dynamics

On some sites, the Mountain alder-common snowberry Association has succeeded other moister mountain alder associations through sediment deposition, increased soil depth and drier soils overall. The herb layer reflects drier soils than other moister mountain alder association and is more closely related to the Ponderosa pine/Common snowberry Association, which may indicate that sites will succeed to this coniferous association with increasing deposition of sediments and drying of soils.

With overuse by livestock, the alder canopy becomes disrupted and clumpy. Alder decreases in vigor as indicated by dead shrubs, highlining, and lack of young age classes. The competitive ability of snowberry is reduced in favor of Kentucky bluegrass and forbs. With continued overuse, both alder and common snowberry become uncommon. They are restricted to protected locations or moist microsites or are absent. Kentucky bluegrass, other grasses, and forbs dominate the site. The stream channel becomes wider and shallower and most of the streambanks erode because of the absence of alder.

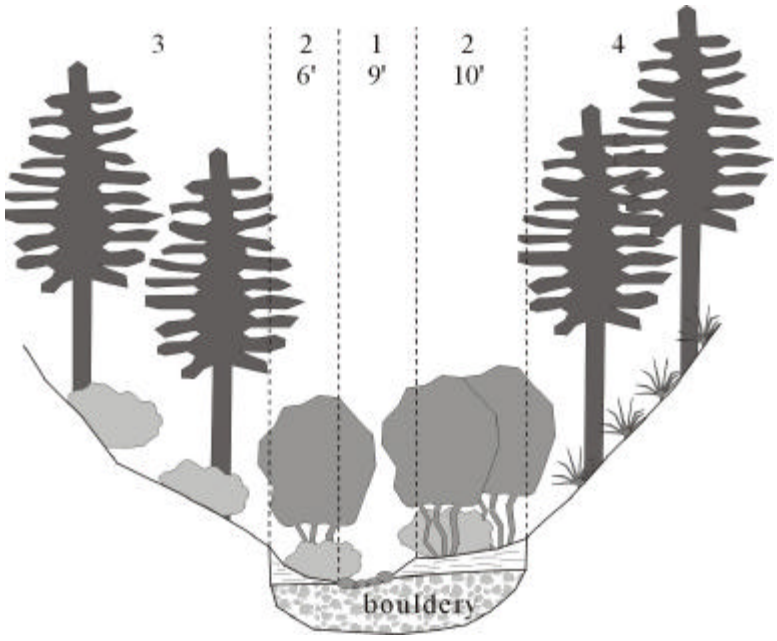
Illustrations



1. Ochoco Creek, third order
2. Mountain alder, active channel shelf
3. **Mountain alder-common snowberry**, banks
4. **Ponderosa pine-common snowberry**-floodplain, inactive floodplain

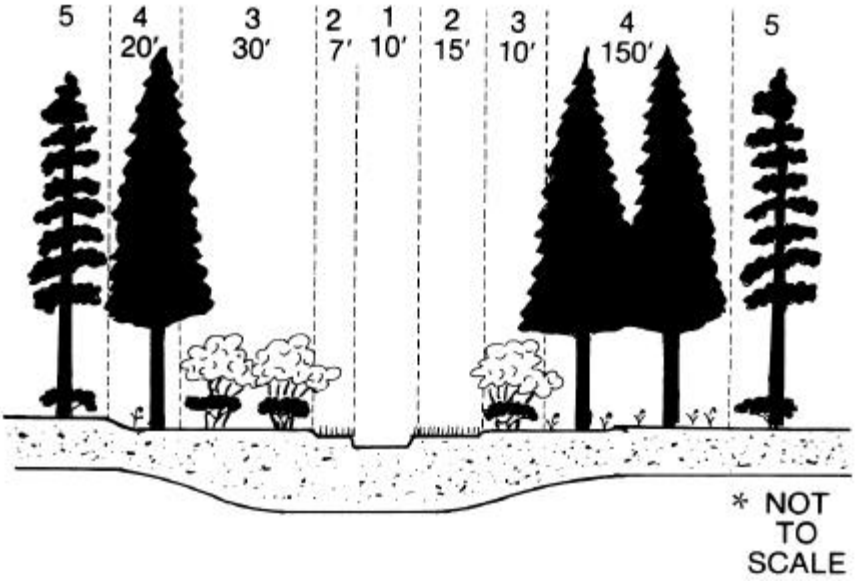
Ochoco Creek; mod gradient, low elevation floodplain; Ochoco Mountains Physiographic Area.

1. B2 stream reach
2. **Mountain alder-common snowberry**, floodplain
3. Douglas-fir/pinegrass, east-facing sideslope
4. Douglas-fir/Common snowberry, west-facing sideslope



Vestor Creek, Bear Valley RD, Malheur NF; high gradient, mod. elevation, V-shaped valley

1. Lake Creek, third order
2. **Small-fruit bulrush (bigleaf sedge),** active channel shelves
3. **Mountain alder-common snowberry**, active floodplains
4. White fir/queencup beadlily, inactive floodplains
5. **Ponderosa pine/common snowberry**-floodplain,terraces



Lake Creek; mod-low gradient, low elevation floodplain; Low Flanks Cascades Physiographic Area.

Alnus incana-Betula occidentalis Association

Mountain alder/Western birch Association
12 plots. CEGL001142

Ecoregional Range
BM

Environment and Soils
The Mountain alder-western birch Association generally occurs in Ponderosa pine and Bluebunch wheatgrass zones in the Blue Mountins, at a lower elevation range than the Mountain alder-red-osier dogwood Association. The dominance of western birch over red-osier dogwood may also be due to sites being more geomorphically stable. Valleys are V-, box- and trough-, and flat-shaped and are narrow to moderately wide with moderate gradients and moderately steep to steep sideslopes. Fluvial surfaces are stream-banks and floodplains. Rosgen stream reach types adjacent to sites sampled are B3, F2, F3, F4, C2, and C4.

Valley Environment	Average	Range
Elevation (ft)	3085	2200-4060
Plot Slope (%)	5	0.5-33
Valley Width (m)	32	5-65
Valley Gradient (%)	2	--
Valley Sideslopes (%)	60	45-70
Soil Characteristics		
Water Table Depth (cm)	65	33-91
Rooting Depth (cm)	63	31-81
Depth to 30% Coarse Fragments (cm)	46	0-86
Depth to 80% Coarse Fragments (cm)	62	28-86
Soil Surface Cover (%)		
Submerged	tr	0-tr
Bare Ground	6	0-20
Gravel	6	0-20
Rock	9	0-50
Cryptogam	15	0-78
Litter	61	20-96

Vegetation Composition
Western birch dominates the shrub overstory with an average height of 15m, ranging from 6 to 25 m. The shrub understory is dominated by mountain alder (averaging 10m in height, ranging from 7 to 15 m). Other shrub scattered through the understory include red-osier dogwood, Lewis' mockorange, common chokecherry and common snowberry. The herbaceous layer, which averages 52 cm in height, is generally dominated by graminoids and warm site herbs, such as starry false Solomon's seal, western clematis, field mint and common cowparsnip. Herbaceous biomass averages 577 lbs/acre, ranging from 267 to 1050 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Water birch (*Betula occidentalis*)	100	51	3-80
Mountain alder (*Alnus incana*)	100	33	3-90
Red-osier dogwood (*Cornus sericea*)	83	15	1-63
Lewis' mockorange (*Philadelphus lewisii*)	75	5	tr-10
Common chokecherry (*Prunus virginiana*)	50	2	tr-3
Common snowberry (*Symphoricarpos albus*)	42	15	tr-55
Wood's rose (*Rosa woodsii*)	42	10	tr-40
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	67	18	tr-40
Blue wildrye (*Elymus glaucus*)	58	1	tr-3
PERENNIAL FORBS			
Starry false Solomon's seal (*Maiathemum stellata*)	67	3	tr-15
Western clematis (*Clematis ligusticifolia*)	50	3	tr-4
Field mint (*Mentha arvensis*)	50	1	tr-3
Common cowparsnip (*Heracleum maximum*)	42	3	tr-15
Dandelion (*Taraxacum officinale*)	42	3	tr-11
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	50	tr	tr-1
Common scouring rush (*Equisetum hyemale*)	33	1	tr-3

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are: terraces - Ponderosa pine/common snowberry and Douglas fir/common snowberry; sideslopes - Bluebunch wheatgrass, Idaho fescue and ponderosa pine types.

Successional Dynamics
This association may transition to the *Betula occidentalis/Symphoricarpos albus* Association with increased deposition of sediments, decreased flooding of sites, and lowering of water table depths.

Other Studies Documenting Association with Plot Data
None

*Alnus incana-Cornus sericea-Philadelphus lewisii Association**

Mountain alder-Red-osier dogwood-Lewis' mockorange Association
3 plots. New type.

Valley Environment	Average	Range
Elevation (ft)	2507	2000-3320
Plot Slope (%)	5	2-9
Valley Width (m)	15	5-20
Valley Gradient (%)	6	2-10
Valley Sideslopes (%)	62	45-70

Ecoregional Range
BM

Environment and Soils
The Mountain alder-red-osier dogwood-Lewis' mockorange Association occurs in the Blue Mountains Ecoregion. It is similar to the Mountain alder-red-osier dogwood Association but occurs at a lower elevational range in a warmer biophysical environment as indicated by the presence of Lewis' mockorange and western clematis. Valleys are narrow, V- and box-shaped with moderate to high gradients and moderately steep to steep sideslopes. Fluvial surfaces are streambanks. Adjacent Rosgen stream reach types are B3 and F2.

Vegetation Composition
The shrub overstory is dominated by mountain alder, and the shrub understory is dominated by red-osier dogwood and Lewis' mockorange with stinking swamp currant, MacKenzie's willow, common chokecherry, Wood's rose and other warm site shrubs scattered through the understory of some sites. The herbaceous layer is sparsely populated with various forbs and graminoids.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Red-osier dogwood (*Cornus sericea*)	100	46	38-63
Mountain alder (*Alnus incana*)	100	30	15-38
Lewis' mockorange (*Philadelphus lewisii*)	100	15	--
Stinking swamp currant (*Ribes hudsonianum*)	33	3	--
MacKenzie's willow (*Salix prolixa*)	33	3	--
Common chokecherry (*Prunus virginiana*)	33	3	--
Wood's rose (*Rosa woodsii*)	33	3	--
SEDGES and RUSHES			
Torrent sedge (*Carex nudata*)	67	tr	--
PERENNIAL GRASSES			
Reed canarygrass (*Phalaris arundinacea*)	67	tr	--
PERENNIAL FORBS			
Western clematis (*Clematis ligusticifolia*)	100	5	tr-15
Hairy willow-herb (*Epilobium ciliatum*)	67	tr	--
Western goldenrod (*Solidago occidentalis*)	67	tr	--
Water hemlock (*Cicuta douglasii*)	67	tr	--
Sharptooth angelica (*Angelica arguta*)	33	3	--

Other Studies Documenting Association with Plot Data
none

*Rhamnus alnifolia/Mertensia paniculata Association**

Alder buckthorn/Tall bluebells Association

3 plots. CEGL001132 = *Rhamnus alnifolia* Shrubland Association.

Ecoregional Range

BM

Environment and Soils

This association occurs where patches of rhizomatous Rhamnus alnifolia occur within moist forest zones at moderate elevations of the Blue Mountains Ecoregion. Valleys are narrow to wide, moderate gradient, V- and trough-shaped with gentle to steep sideslopes. Fluvial surfaces are streambanks and floodplains. Rosgen stream reach types adjacent to sites sampled are A5, C4 and F6. Water tables are high during the early part of the growing season.

Valley Environment	Average	Range
Elevation (ft)	4433	4100-4900
Plot Slope (%)	4	2-5
Valley Width (m)	95	20-200
Valley Gradient (%)	3	2-5
Valley Sideslopes (%)	35	15-45
Soil Characteristics		
Depth to Redox Features (cm)	24	18-30
Depth to 30% Coarse Fragments (cm)	46	33-58
Depth to 80% Coarse Fragments (cm)	55	51-58
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	6	2-10
Gravel	-	-
Rock	-	-
Cryptogam	25	0-50
Litter	69	40-98

Vegetation Composition

Alder-leaved buckthorn forms a very dense canopy over a scattering of understory shrubs, ranging in height from 0.9 to 1.8 m. Mountain alder is often a co-dominant. The herbaceous layer is a rich assemblage of moist site herbes, including tall bluebells, sweet-scented bedstraw, large-leaf avens, stinging nettle, western meadowrue, heart-leaf miner's lettuce and Great North aster, and averages 31 cm in height. Herbaceous biomass averages 800 lbs/acre, ranging from 67 to 1533 lbs/acre.

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are: sideslopes -Grand fir / Twinflower and other grand fir associations.

Other Studies Documenting Association with Plot Data

None

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Alder-leaved buckthorn (*Rhamnus alnifolia*)	100	78	65-95
Stinking swamp currant (*Ribes hudsonianum*)	100	10	4-20
Mountain alder (*Alnus incana*)	67	68	60-75
Common snowberry (*Symphoricarpos albus*)	67	5	--
PERENNIAL GRASSES			
Columbia brome (*Bromus vulgaris*)	67	5	4-5
Drooping woodreed (*Cinna latifolia*)	67	2	--
Tall mannagrass (*Glyceria striata*)	67	2	1-3
PERENNIAL FORBS			
Large-leaf avens (*Geum macrophyllum*)	100	2	1-4
Sweet-scented bedstraw (*Galium triflorum*)	100	2	1-5
Tall bluebells (*Mertensia paniculata*)	100	2	1-4
Stinging nettle (*Urtica dioica*)	67	10	4-15
Western meadowrue (*Thalictrum alpinum*)	67	3	2-4
Heart-leaved miner's lettuce (*Claytonia cordifolia*)	67	2	1-3
Great North aster (*Canadanthus modestus*)	67	2	1-3
Hairy willow-herb (*Epilobium ciliatum*)	67	1	--
Columbia monkshood (*Aconitum columbianum*)	67	tr	--
FERNS and HORSETAILS			
Ladyfern (*Athyrium filix-femina*)	67	2	--

*Cornus sericea ssp. sericea/Saxifraga odontoloma Association**

Red-osier dogwood/Brook saxifrage Association
2 plots. New type

Ecoregional Range
BM

Environment and Soils
The Red-osier dogwood/Brook saxifrage Association occurs at moderate elevations in the moist coniferous forest zone of the Blue Mountains. Sites are very high gradient seep slopes. The soils are Entisols consisting of large fragmented rocks with organic-rich, fine-textured material between the rocks and on the surface of the site. Water runs slowly down the slope at or near the surface, and the soils appear to be saturated throughout the growing season.

Valley Environment	Average	Range
Elevation (ft)	4395	3670-5120
Plot Slope (%)	55	45-65
Valley Width (m)	13	5-20
Valley Gradient (%)	6	2-10
Valley Sideslopes (%)	30	15-45
Soil Characteristics		
Depth to Wet Soil (cm)	0	--
Current Water Table Depth (cm)	10	--
Depth to 80% Coarse Fragments (cm)	0	--
Soil Surface Cover (%)		
Submerged	1	tr-2
Bare Ground	2	0-3
Gravel	-	-
Rock	2	1-2
Moss	90	87-92
Liverwort	3	0-5
Lichen	tr	0-tr
Litter	4	2-5

Vegetation Composition
Red-osier dogwood forms a scattered shrub overstory layer, averaging 2.5 m in height. Prickly currant and stinking swamp currant comprise a scattered shrub understory, averaging 60 cm in height. Brook saxifrage forms a dense carpet in the herbaceous layer and numerous other wet sites forbs and graminoids occur in low cover on sites. The herbaceous layer averages 31 cm in height. Mosses form a nearly continuous ground cover.

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are: Subalpine fir (*Abies lasiocarpa*)/Twinflower and grand fir associations.

Successional Dynamics
These sites are probably not successional to any other association.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE UNDERSTORY			
Engelmann spruce (*Picea engelmannii*)	100	3	1-4
Grand fir (*Abies grandis*)	50	1	--
SHRUBS			
Red-osier dogwood (*Cornus sericea*)	100	25	15-35
Stinking swamp currant (*Ribes hudsonianum*)	100	11	7-15
Prickly currant (*Ribes lacustre*)	100	3	2-3
Twinflower (*Linnaea borealis*)	100	1	--
Lewis' mockorange (*Philadelphus lewisii*)	50	8	--
Rocky Mountain maple (*Acer glabrum*)	50	4	--
SEDGES and RUSHES			
Soft-leaved sedge (*Carex disperma*)	50	6	--
Dewey's sedge (*Carex deweyana*)	50	2	--
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	100	6	1-10
Columbia brome (*Bromus vulgaris*)	100	5	--
Nodding Fescue *(Festuca subulata)*	50	35	--
PERENNIAL FORBS			
Brook saxifrage (*Saxifraga odontoloma*)	100	58	40-75
Hairy willow-herb (*Epilobium ciliatum*)	100	3	tr-5
Sweet-scented bedstraw (*Galium triflorum*)	100	1	tr-1
Yellow monkeyflower (*Mimulus guttatus*)	100	1	--
Side-flowered mitrewort (*Mitella stauropetala*)	50	6	--
Baneberry (*Actaea rubra*)	50	5	--
Oneleaf foamflower (*Tiarella trifoliata* var. *unifoliata*)	50	5	--
Musk monkeyflower (*Mimulus moschatus*)	50	5	--

Spiraea douglasii Association

Douglas' spiraea Association
6 plots - CEGL001129

Valley Environment	Average	Range
Elevation (ft)	4140	2540-5900
Plot Slope (%)	7	0-35
Valley Width (m)	50	20-65
Valley Gradient (%)	9	2-35
Valley Sideslopes (%)	53	45-70
Soil Surface Cover (%)		
Submerged	15	10-20
Bare Ground	19	0-60
Gravel	14	0-70
Rock	11	0-37
Moss	2	0-5
Litter	49	0-95

Ecoregional Range

EC

Environment and Soils

The Douglas' spiraea Association occurs predominantly in the East Cascades Ecoregion. Some sites are along steep, fast-flowing streams. Other sites are flat montane meadows that are flooded in spring and dry in the summer. Stream valleys are narrow to moderately wide, U- and box-shaped with moderate to very high gradients moderately steep to steep sideslopes. Rosgen stream reach types adjacent to these riparian sites are C3, D6 and F2. Soils are saturated in early summer, but water levels are very deep by late summer. Soil textures range from sandy skeletal loam to loam.

Vegetation Composition

The dense shrub layer is dominated by Douglas spiraea, under which there is a sparse herbaceous layer. Other shrubs occasionally scattered in the shrub over- and understory are Wood's rose, Lemmon willow, common chokecherry, red-osier dogwood and Sitka willow. The scant herb layer includes species such as bluejoint reedgrass, tall mannagrass, Canada violet, common cowparsnip, arrowleaf groundsel, and asters. Two plots had significant small-fruit bulrush cover indicating wetter soil conditions during the growing season than the other sites sampled.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Douglas' spiraea (*Spiraea douglasii*)	100	74	70-85
Wood's rose (*Rosa woodsii*)	33	15	--
Lemmon willow (*Salix lemmonii*)	33	2	tr-3
SEDGES and RUSHES			
Small-fruit bulrush (*Scirpus microcarpus*)	50	18	5-30
Baltic rush (*Juncus balticus*)	33	tr	--
PERENNIAL GRASSES			
Bluejoint reedgrass (*Calamagrostis canadensis*)	50	5	5-10
Tall mannagrass (*Glyceria striata*)	33	11	1-20
Creeping bentgrass (*Agrostis stolonifera*)	33	5	1-8
Kentucky bluegrass (*Poa pratensis*)	33	2	1-3
Meadow barley (*Hordeum brachyantherum*)	33	tr	--
PERENNIAL FORBS			
Canada violet (*Viola canadensis*)	33	5	--
Common cowparsnip (*Heracleum maximum*)	33	3	--
Arrowleaf groundsel (*Senecio triangularis*)	33	3	tr-5
Asters (*Aster* spp.)	33	2	tr-3
Cooley's hedgenettle (*Stachys chamissonis* var. *cooleyea*)	33	2	tr-3
Starry false Solomon's seal (*Maianthemum stellata*)	33	2	tr-3
Large-leaf avens (*Geum macrophyllum*)	33	1	tr-1
Hairy willow-herb (*Epilobium ciliatum*)	33	1	tr-1
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	33	3	tr-5

Other Studies

Documenting Association with Plot Data

Oregon: Hemstrom *et al.* 1987: 250, 259; Kovalchik 1987: 137; Titus and Christy 1996e, 1997
Washington: Kovalchik 2000; Kunze 1994: 31, 90

Dasiphora floribunda Association

Shrubby cinquefoil Association
11 plots. CEGL001105

Ecoregional Range
BM, BR, EC

Environment and Soils
The Shrubby cinquefoil Association is widespread but rather uncommon in the Blue Mountains, East Cascades and Basin and Range Ecoregions. Valleys are wide to very wide, U-, flat-, and trough-shaped with moderately low gradients and moderately steep side slopes. Fluvial sites are the edges of broad meadows or on stream terraces. Associated Rosgen stream reach types are E4 and E6. Streams are usually 0.5-5 m wide with small woody debris affecting less than 10% of the active channel. Soils are deep, fine-textured (clay loam, silt loam, fine sandy loam) Endoaquolls. Coarse fragments are absent or very deep in the profile. Sites are probably rarely flooded on the surface, but the water table is seasonally high, fluctuating from 40-100 cm below the soil surface.

Valley Environment	Average	Range
Elevation (ft)	4866	4400-5220
Plot Slope (%)	2	tr-4
Valley Width (m)	285	65-350
Valley Gradient (%)	2	--
Valley Sideslopes (%)	41	15-70
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	6	0-15
Gravel	1	0-5
Rock	1	0-5
Cryptogam	3	0-10
Litter	60	5-100

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt, unknown marine, mixed sedimentary
Water Table Depth (cm)	avg: 81 (range: 25-122)
Total Rooting Depth (cm)	avg: 53 (range: 43-69)
Depth to Redoximorphic Features (cm)	avg: 69 (range: 25-122)
Surface Layer	
Thickness (cm)	28-46
Texture(s)	silt loam
Coarse Fragments (%)	0-1, gravel
Roots	very fine: many fine: common to many medium: none to many coarse: none to few
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	15-64
Texture(s)	silt loam, silty clay loam, fine sandy loam
Coarse Fragments (%)	0-20, gravel
Roots	very fine: none to common fine: none to common medium: none to few coarse: none to few
Redoximorphic Features	some iron concentrations
Substrate	clay loam, gravelly sand

Vegetation Composition

This type is a Shrubby cinqefoil/Kentucky bluegrass association, which is a grazing-induced seral stage of the natural shrubby cinquefoil/tufted hairgrass assosication. Overgrazing of tufted hairgrass causes it to lose vigor and eventually be replaced by Kentucky bluegrass. Kentucky bluegrass may then become the naturalized potential herbaceous understory since it is difficult to remove once established. In both communities, shrubby cinquefoil is scattered (cover ranges from 10-50%). In an undisturbed Shrubby cinquefoil/tufted hairgrass community, the tufted hairgrass cover is high with sparse forb occurrence between tufts. With heavy grazing various graminoids and forbs such as Nebraska sedge, Baltic rush, Kentucky bluegrass, northwest cinquefoil, yarrow, broadpetal strawberry, and rosy pussytoes increase in cover. With continued over-grazing, Kentucky bluegrass becomes the dominant graminoid.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Shrubby cinquefoil (*Dasiphora floribunda*)	100	35	15-50
SEDGES and RUSHES			
Baltic rush (*Juncus balticus*)	82	14	tr-50
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	100	32	tr-65
Prairie junegrass (*Koeleria macrantha*)	36	4	2-5
PERENNIAL FORBS			
Slender cinquefoil (*Potentilla gracilis*)	100	28	13-70
Yarrow (*Achillea millefolium*)	100	10	1-35
Broadpetal strawberry (*Fragaria virginiana*)	91	8	2-15
Littleleaf pussytoes (*Antennaria microphylla*)	55	4	1-8
Northern bedstraw (*Galium boreale*)	55	2	tr-6
Oregon checkermallow (*Sidalcea oregana*)	36	5	2-10

Shrubby cinquefoil averages 0.5 m in height (ranging from 0.3 to 0.9 m). The herbaceous layer averages 31 cm in height. Herbaceous biomass averages 1290 lbs/acre, ranging from 800-1670 lbs/acre.

Adjacent Vegetation

Upland vegetation types on adjacent sideslopes are:
sideslopes -Ponderosa pine/antelope bitterbrush/Geyer's sedge, Douglas fir/elk sedge, Douglas-fir/Common snowberry and other ponderosa pine, Big sagebrush, quaking aspen associations.

Successional Dynamics

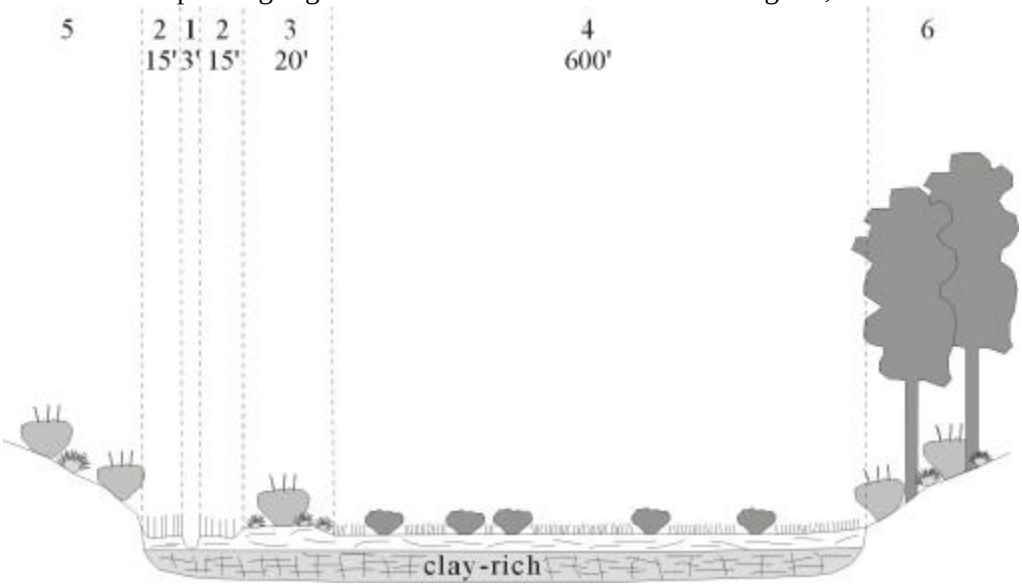
This association is generally in poor vegetative condition where it has been sampled in the interior western United States. Sites were and still are highly desired livestock grazing areas and have been heavily utilized and generally overutilized for many decades. Thus, it is difficult to determine in many situation what the original herbaceous vegetation composition was. Most sites are now dominated by exotic graminoids, such as *Poa pratensis* and weedy native and exotic forbs, such as *Potentilla gracilis*.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997 described more described the *Dasiphora floribunda/Deschampsia caespitosa* Plant Association and *Dasiphora floribunda/Poa pratensis* Plant Community Type, which are included is this association.
Nevada: Manning and Padgett 1995 (*Dasiphora floribunda/Ligusticum grayi*)
Montana: Hansen *et al.* 1995 (*Dasiphora floribunda/Deschampsia caespitosa*)
Utah and southeastern Idaho: Padgett *et al.* 1989 (*Dasiphora floribunda/Deschampsia caespitosa* and *Potentilla/Poa pratensis*)
Eastern Idaho/western Wyoming: Youngblood *et al.* 1985 (*Dasiphora floribunda /Deschampsia caespitosa* and *Potentilla/Poa pratensis*)

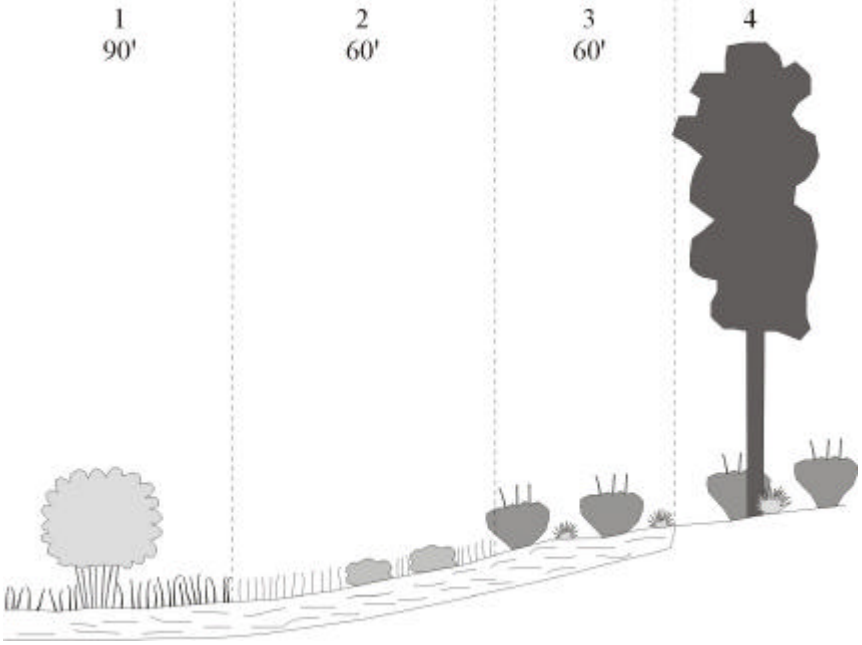
Illustrations

1. E4 stream reach
2. **Baltic rush**, floodplain
3. **Mountain big sagebrush/Cusick's bluegrass**, terrace
4. **Shrubby cinquefoil/Tufted hairgrass**, moist meadow
5. Big sagebrush/Idaho fescue-bluebunch wheatgrass, northeast-facing toeslope
6. Ponderosa pine/big sagebrush/Idaho fescue-bluebunch wheatgrass, southwest-facing toeslope



Wickiup Creek, Bear Valley RD, Malheur NF; mod. gradient, mod. high elevation, trough-shaped valley Zone

1. Willow/sedge, wet meadow
2. **Shrubby cinquefoil/Tufted hairgrass**, moist meadow
3. **Mountain big sagebrush/Cusick's bluegrass**, dry meadow
4. Ponderosa pine/big sagebrush/Idaho fescue-bluebunch wheatgrass, east-facing toeslope



Crooked Creek Meadows, Bear Valley RD, Malheur NF; very low gradient, mod. high elevation, trough-shaped basin; Continental Zone.

*Artemisia cana/Deschampsia caespitosa Association**

Silver sagebrush/Tufted hairgrass Association

1 plot. CEGL001074 = *Artemisia cana* ssp. *viscidula / Deschampsia caespitosa*

Ecoregional Range

BM, BR, EC

Environment and Soils

Only one location was sampled in the Blue Mountains Ecoregion to describe this association. It has also been reported from both the East Cascades and Basin and Range Ecoregions, although not sampled there. Many sites may have been lost through excessive livestock grazing over the past 150 years. The valley setting for the sampled location is narrow and moderately low gradient with moderately steep side slopes. The fluvial surface is a moist meadow. The soil us deep, fine-textured mineral material. Coarse fragments are absent or very deep in the profile. The water table is seasonally high, fluctuating from 60-100 cm below the soil surface.

Valley Environment	Average
Elevation (ft)	5040
Plot Slope (%)	2
Valley Width (m)	20
Valley Gradient (%)	2
Valley Sideslopes (%)	15
Soil Characteristics	
Depth to Redoximorphic Features (cm)	51
Current Water Table Depth (cm)	74
Soil Surface Cover (%)	
Submerged	-
Bare Ground	3
Gravel	-
Rock	-
Moss	5
Litter	92

Vegetation Composition

Artemisia cana comprises the shrub layer, averaging 0.6 m in height. The herbaceous layer, averaging 20 cm in height is dominated by tufted hairgrass and Baltic rush with various other forbs and graminoids typical of meadows scattered through the site. Herbaceous biomass is 770 lbs/acre.

Dominant Species	Canopy Cover (%)
SHRUBS	
Silver sagebrush (*Artemisia cana*)	80
Whitestem gooseberry (*Ribes inerme*)	tr
SEDGES and RUSHES	
Baltic rush (*Juncus balticus*)	40
PERENNIAL GRASSES	
Tufted hairgrass (*Deschampsia caespitosa*)	25
Cusick's bluegrass (*Poa cusickii*)	5
Meadow barley (*Hordeum brachyantherum*)	3
Thurber's bentgrass (*Agrostis humilis*)	2
PERENNIAL FORBS	
Tawny horkelia (*Horkelia fusca*)	7
Rydberg's penstemon (*Penstemon rydbergii*)	3
Large-leaf avens (*Geum macrophyllum*)	1
White-headed mule's ear (*Wyethia helianthoides*)	1
Slender cinquefoil (*Potentilla gracilis*)	tr
Oregon checkermallow (*Sidalcea oregana*)	tr

Adjacent Vegetation

Upland vegetation types adjacent to the site sampled are:
sideslopes -Big sagebrush/Idaho fescue-Bluebunch wheatgrass and Ponderosa pine/big sagebrush/Idaho fescue-bluebunch wheatgrass.

Successional Dynamics

With heavy grazing various graminoids and forbs such as Nebraska sedge, Baltic rush, Kentucky bluegrass, northwest cinquefoil, yarrow, broadpetal strawberry, and rosy pussytoes increase in cover. With continued overgrazing, Kentucky bluegrass becomes the dominant graminoid. Kentucky bluegrass may then become the naturalized potential herbaceous understory since it is difficult to remove once established.

Taxonomic Note

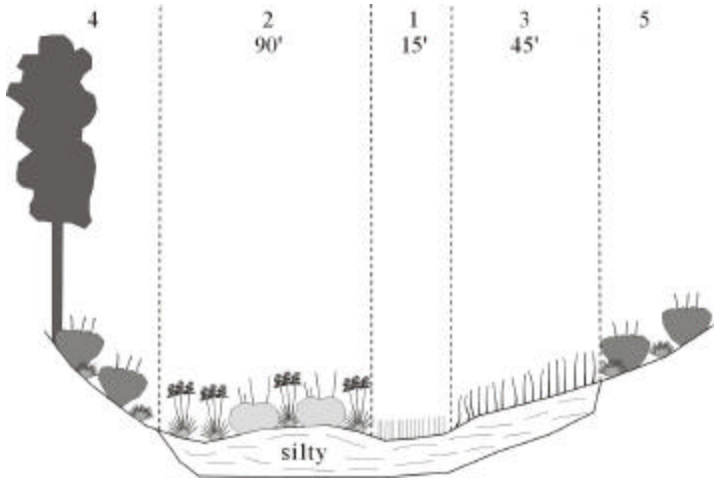
Artemisia cana in Oregon has not been distinguished by subspecies as it has been elsewhere. There are two subspecies of *A. cana* in Oregon, ssp. *viscidula* which occurs in the Owyhee uplands and Northern Basin and Range, and ssp. *bolanderi* which occurs in the East Cascades and Blue Mountains. Both of the types described here, as sampled, represent stands of the subspecies *bolanderi.* However, the lack of data makes it impossible for us to distinguish them here. We hope to do this, and add additional silver sagebrush types, in a future edition of this guide. The type in the NVC is *Artemisia cana* ssp. *viscidula / Deschampsia caespitosa*.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997
Utah and southeastern Idaho: Padgett *et al.* 1989

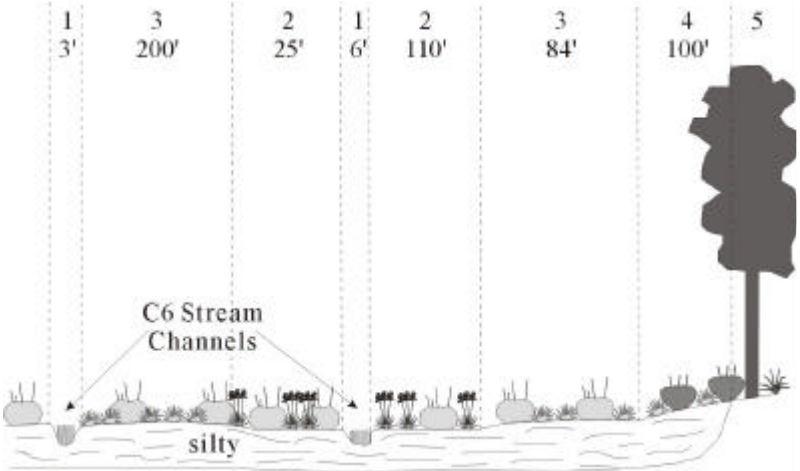
Illustrations

1. **Baltic rush**-filled swale
2. **Silver sagebrush/tufted hairgrass**, floodplain
3. **Sheldon's sedge**, seep slope
4. Ponderosa pine/big sagebrush/Idaho fescue-bluebunch wheatgrass, sw-facing sideslope
5. Big sagebrush/Idaho fescue-bluebunch wheatgrass, northwest-facing sideslope



Fuqua Creek, Burns RD, Malheur NF; very low gradient, mod. high elevation, trough-shaped valley

1. **Baltic rush**-filled C6 stream reaches
2. **Silver sagebrush/tufted hairgrass**, floodplain-moist meadow
3. **Silver sagebrush/Cusick's bluegrass**, moist meadow
4. **Mountain big sagebrush/Cusick's bluegrass**, dry meadow
5. Ponderosa pine/elk sedge, northeast-facing sideslope



Dollar Basin, Prairie City RD, Malheur NF; very low gradient, mod. high elevation, trough-shaped basin

Artemisia cana/Poa cusickii Association

Silver sagebrush/Cusick's bluegrass Association
4 plots. CEGL001551

Valley Environment	Average	Range
Elevation (ft)	5275	4990-5540
Plot Slope (%)	1	1-2
Valley Width (m)	350	--
Valley Gradient (%)	1	1-2
Valley Sideslopes (%)	30	15-45
Soil Characteristics		
Water Table Depth (cm)	140	110-170
Rooting Depth (cm)	27	23-30
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	29	2-60
Gravel	-	
Rock	-	
Cryptogam	3	0-5
Litter	68	35-98

Ecoregional Range
BM, BR, EC

Environment and Soils
This association occurs at moderately high elevations in the Blue Mountains, Basin and Range and East Cascades Ecoregions in very broad, low gradient, trough-shaped valleys with gentle to moderately steep sideslopes. Sites are meadows, and stream terraces. Soils are deep Haploborolls or Argoborolls composed of easily eroded alluvium with silt loam, clay loam, or fine sandy loam textures and are lacking in coarse fragments. Available water holding capacity is high. The water table is probably within the silver sagebrush rooting zone early in the growing season but drops to 60+ cm by early summer. Sites have higher water tables than the Mountain big sagebrush/Cusick's bluegrass Association and often occur in a lower topographic position adjacent to Mountain big sagebrush/Cusick's bluegrass or another mountain big sagebrush association.

Vegetation Composition
Silver sagebrush forms a scattered shrub layer (averaging 1.5 m in height, ranging from 1-2m) with an herbaceous layer of Cusick's bluegrass and a variety of forbs including northwest cinquefoil, Rydberg's penstemon, yarrow, and aster. The herbaceous layer averages 23 cm in height, ranging from 15-30 cm. Herbaceous biomass averages 1090 lbs/acre, ranging from 900 to 1270 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Silver sagebrush (*Artemisia cana*)	100	35	20-60
SEDGES and RUSHES			
Baltic rush (*Juncus balticus*)	50	2	--
Lidden's sedge (*Carex petasata*)	50	2	tr-3
PERENNIAL GRASSES			
Cusick's bluegrass (*Poa cusickii*)	100	45	15-70
Prairie junegrass (*Koeleria macrantha*)	75	3	1-5
Bearded wheatgrass (*Elymus caninus*)	75	2	tr-5
Western needlegrass (*Stipa occidentale* ssp. *occidentale*)	50	23	2-3
PERENNIAL FORBS			
Yarrow (*Achillea millefolium*)	100	3	1-7
Slender cinquefoil (*Potentilla gracilis*)	75	41	2-75
Rydberg's penstemon (*Penstemon rydbergii*)	75	4	2-7
Shorttooth Canadien milkvetch (*Astragalus canadensis* var. *brevidens*)	50	4	2-5
Elk thistle (*Cirsium foliosum*)	50	3	2-3
FERNS and HORSETAILS			
Common scouring Rush (*Equisetum hyemale*)	50	tr	--
ANNUAL FORBS			
Small-flowered blue-eyed Mary (*Collinsia parviflora*)	50	2	--
Hairy owl clover (*Castilleja tenuis*)	50	1	tr-2

Adjacent Vegetation
Adjacent upland vegetation types were:
sideslopes – Mountain big sagebrush/Idaho fescue-Bluebunch wheatgrass, Ponderosa pine/Geyer's sedge and Western juniper/big sagebrush.

Successional Dynamics
This association occurs on some of the most overused grazing allotments in central and eastern Oregon. Livestock grazing often has been season-long for many decades and plants have been utilized when they were most susceptible to damage.

With overuse by livestock, sagebrushes, graminoids, and forbs become codominant with Cusick bluegrass. Cusick bluegrass clumps are somewhat broken and pedestalled. Perennial and annual forbs are present in moderately large colonies or in the interspaces of Cusick bluegrass. The litter layer is discontinuous and compacted.

With continued overuse, sagebrushes (canopy cover greater than 35 percent) become dominant over graminoids and forbs. Cusick bluegrass is uncommon. Cusick bluegrass clumps are pedestalled and strongly aggregated. Perennial and annual forbs dominate the herbaceous layer. The litter layer is compacted and very broken in distribution.

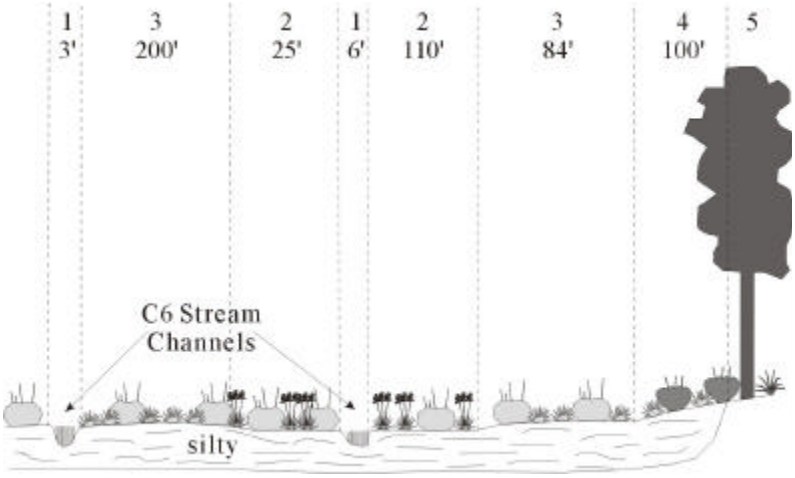
Most floodplain landforms supporting this association have experienced severe streambed downcutting and lowered water tables. Under these hydrologic conditions sagebrush/Cusick bluegrass has often expanded into sites formerly occupied by the willow/woolly sedge association.

Other Studies Documenting Association with Plot Data
Oregon: Kovalchik's *Artemisia/Poa cusickii* Association (1987) for central Oregon includes *Artemisia cana/Poa cusickii* sites; Crowe and Clausnitzer 1997

Note
While subspecies of silver sagebrush have not been recognized in Oregon, these silver sagebrush stands are apparently *Artemisia cana* ssp. *bolanderi.*

Illustrations

1.**Baltic rush**-filled C6 stream reaches
2.**Silver sagebrush/tufted hairgrass**, floodplain-moist meadow
3.**Silver sagebrush/Cusick's bluegrass**, moist meadow
4.**Mountain big sagebrush/Cusick's bluegrass**, dry meadow
5.Ponderosa pine/elk sedge, northeast-facing sideslope



Dollar Basin, Prairie City RD, Malheur NF; very low gradient, mod. high elevation, trough-shaped basin

Artemisia tridentata ssp. vaseyana/Poa cusickii Association

Mountain big sagebrush/Cusick's bluegrass Association
10 plots. CEGL001031

Ecoregional Range
BM, BR, EC

Environment and Soils
The Mountain big sagebrush/Cusick's bluegrass Association is common in the Blue Mountains, Basin and Range and East Cascades Ecoregions. Valleys in which it occurs are broad, flat- and trough-shaped valleys and basins. Adjacent side slopes are gentle to moderately steep. Terraces created by stream downcutting are the dominant fluvial surface on which this type occurs, although it can also occur on the edge of basins. Associated Rosgen stream types are C6, F5, F6 (the latter two occurring where E5 and E6 streams once flowed). Silt and fine sand bedloads are predominant. Streams are usually 0.5-10 m wide with essentially no woody debris affecting the channel. Soils are deep, fine-textured (silt loam, clay loam, sandy loam), coarse-fragment free Mollisols. These soils are developed from easily eroded alluvium. Available water holding capacity is moderately high. In some years the water table may be within 3 ft. of the soil surface at the beginning of the growing season but drops to well below the rooting zone by mid-summer.

Valley Environment	Average	Range
Elevation (ft)	5057	4430-5540
Plot Slope (%)	3	0.5-7
Valley Width (m)	180	65-350
Valley Gradient (%)	2	1-2
Valley Sideslopes (%)	25	15-45
Soil Characteristics		
Water Table Depth (cm)	129	110-140
Rooting Depth (cm)	44	23-89
Depth to Moist Soil (cm)	13	0-40
Soil Surface Cover (%)		Range
Submerged	-	-
Bare Ground	21	5-40
Gravel	-	-
Rock	tr	0-tr
Cryptogam	3	0-20
Litter	69	15-95

Vegetation Composition
Mountain big sagebrush forms a moderately dense to dense shrub canopy (averaging 0.8 m tall, ranging from 0.6-0.9 m) over a sparse herbaceous understory dominated by Cusick's bluegrass. Cusick bluegrass interspaces are dominated by litter rather than perennial or annual forbs. Forbs include yarrow, slender cinquefoil, dandelion, and shorttooth Canadian milkvetch. Kentucky bluegrass, Baltic rush, and Nebraska sedge (*Carex nebrascensis*), if present, are restricted to moist depressions.

Under heavy grazing thread-leaved sedge increases and can replace Cusick's bluegrass as the dominant graminoid. The herbaceous layer averages 19 cm, ranging from 10-31 cm. Herbaceous biomass averages 700 lbs/acre, ranging from 430 to 1200 lbs/acre.

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
terraces -Low sagebrush (*Artemisia arbuscula*)/Sandberg's bluegrass (*Poa secunda*); sideslopes -Mountain big sagebrush/Idaho fescue (*Festuca idahoensis*)-bluebunch wheatgrass (*Pseudoroegneria spicata*), Ponderosa pine (*Pinus ponderosa*)/mountain big sagebrush/Idaho fescue-bluebunch wheatgrass, ponderosa pine/big sagebrush/Geyer's sedge (*Carex geyeri*) and other ponderosa pine associations.

Other Studies Documenting Association with Plot Data
Oregon: Kovalchik's ARTEM/POCU Association (1987) for central Oregon includes ARCA/POCU sites; Crowe and Clausnitzer 1997

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*)	100	44	10-80
Green rabbitbrush (*Chrysothamnus vicidiflorus*)	50	3	2-5
SEDGES and RUSHES			
Baltic rush (*Juncus balticus*)	60	2	tr-3
Clustered field sedge (*Carex praegracilis*)	50	4	2-7
Threadleaf sedge (*Carex filifolia*)	40	20	1-40
PERENNIAL GRASSES			
Cusick's bluegrass (*Poa cusickii*)	100	30	3-80
Prairie junegrass (*Koeleria macrantha*)	60	3	tr-7
Bearded wheatgrass (*Elymus caninus*)	40	13	tr-45
Western needlegrass (*Stipa occidentale* ssp. *occidentale*)	40	1	tr-2
PERENNIAL FORBS			
Yarrow (*Achillea millefolium*)	90	5	tr-15
Dandelion (*Taraxacum officinale*)	70	1	tr-3
Slender cinquefoil (*Potentilla gracilis*)	60	2	tr-6
Shorttooth Canadian milkvetch (*Astragalus canadensis* var. *brevidens*)	40	2	tr-3
ANNUAL FORBS			
Wingstem monkeyflower (*Mimulus alsinoides*)	40	3	tr-7

Successional Dynamics

This association occurs on some of the most overused grazing allotments in central Oregon. Livestock grazing often has been seasonlong for many decades and plants have been utilized when they were most susceptible to damage.

With overuse by livestock, sagebrushes, graminoids, and forbs become codominant with Cusick bluegrass. Cusick bluegrass clumps are somewhat broken and pedestalled. Perennial and annual forbs are present in moderately large colonies or in the interspaces of Cusick bluegrass. The litter layer is discontinuous and compacted.

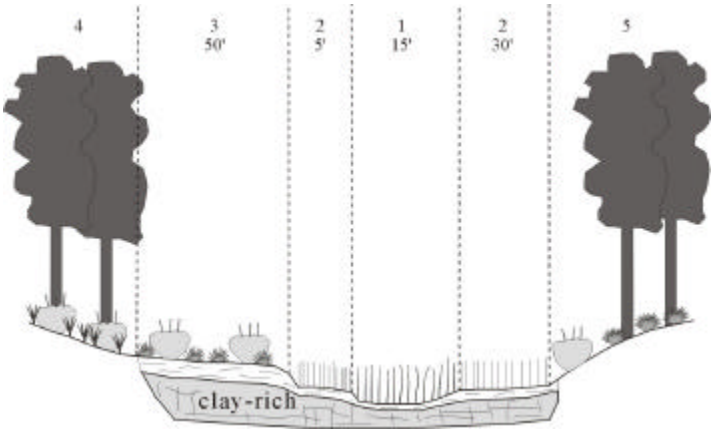
With continued overuse, sagebrushes (canopy cover greater than 35 percent) become dominant over graminoids and forbs. Cusick bluegrass is uncommon. Cusick bluegrass clumps are pedestalled and strongly aggregated. Prairie junegrass, bearded wheatgrass, and western needlegrass are scattered while threadleaf sedge, shortleaved muhly (*Muhlenbergia* richardsonis)and forbs form large patches. Perennial and annual forbs dominate the herbaceous layer. The litter layer is compacted and very broken in distribution.

Most floodplain landforms supporting this association have experienced severe streambed downcutting and lowered water tables. Under these hydrologic conditions sagebrush/Cusick bluegrass has often expanded into sites formerly occupied by the willow/woolly sedge association.

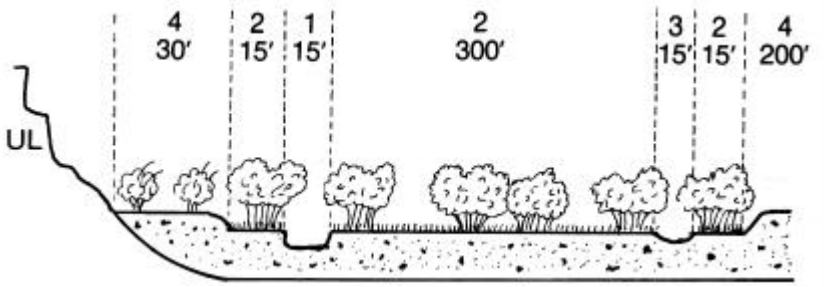
Fire easily kills mountain big sagebrush, and it will not resprout. Seedlings can establish on burned areas from seed stored in the soil and from off-site sources (Bradley 1986a). Because it matures early in the spring and is dormant when most fires occur, Cusick's bluegrass is fairly resistant to fire. Pedestaled plants are more likely to be killed. Plants tend to recover within a few years after burning (Bradley 1986b). Threadleaf sedge can be severely damaged by a hot fire but can survive and resprout after a light to moderate fire. Plants should not be burned during periods of drought (Walkup 1991b).

Illustrations

1. **Nebraska sedge**-filled F6 stream reach
2. **Baltic rush**, floodplain
3. **Mtn. big sagebrush/Cusick's bluegrass**, terrace
4. Ponderosa pine/big sagebrush/elk sedge, southwest-facing sideslope
5. Ponderosa pine/Idaho fescue-bluebunch wheatgrass, northeast-facing sideslope



S. Fk. Trout Creek, RD, Malheur NF; very low gradient, mod. high elevation, trough-shaped valley

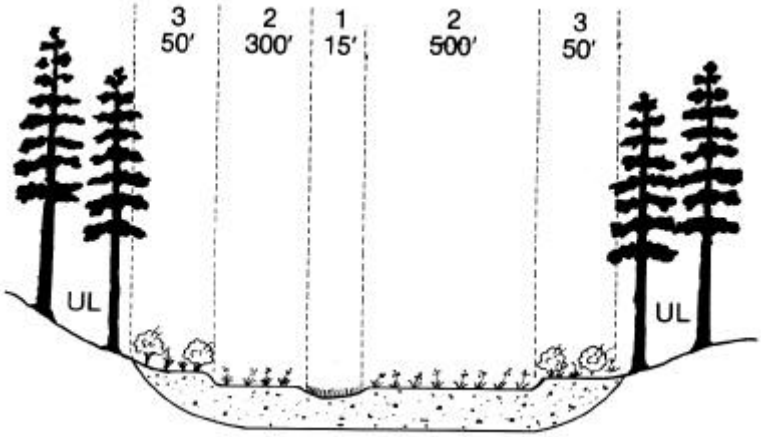


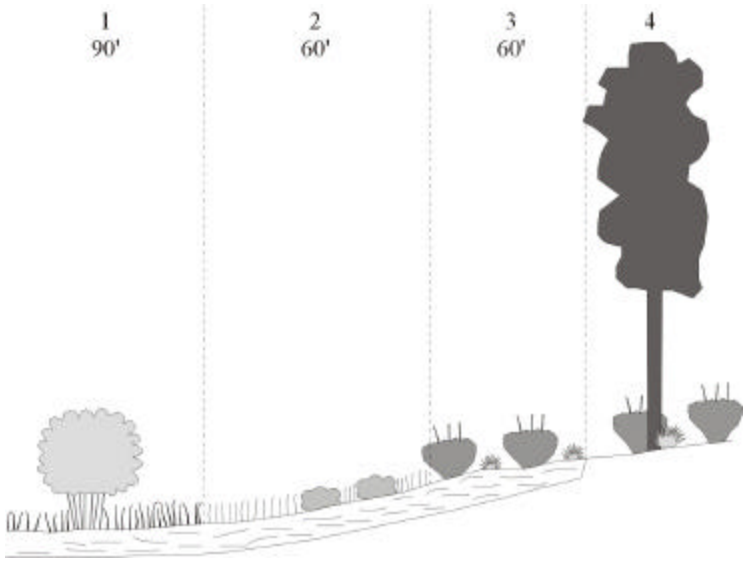
1. Silver Creek, third-order
2. **Booth-Geyer's willow/woolly sedge**, active floodplain
3. **Booth-Geyer's willow/woolly sedge**, overflow channel
4. **Mtn. big sagebrush/Cusick bluegrass**, terraces and inactive floodplains

Silver Creek; low gradient, low elevation floodplain; Ochoco Mountains Physiographic Area.

1. **Nebraska sedge** (inflated sedge potential), swale
2. **Tufted hairgrass**, moist meadow
3. **Mtn. big sagebrush/Cusick bluegrass**, dry meadow

Boone Prairie; low gradient, mod elevation basin; Ochoco Mountains.





1. Willow/sedge, wet meadow
2. **Shrubby cinquefoil/tufted hairgrass**, moist meadow
3. **Mountain big sagebrush/Cusick's bluegrass**, dry meadow
4. Ponderosa pine/big sagebrush/Idaho fescue-bluebunch wheatgrass, east facing toeslope

Crooked Creek Meadows, Bear Valley RD, Malheur NF; very low gradient, mod. high elevation, trough-shaped basin; Continental Zone

HIGH ELEVATION SHRUB ASSOCIATIONS

*Alnus viridis ssp. sinuata/Heracleum lanatum Association**

Sitka alder/Common cowparsnip Association
4 plots. New type

Ecoregional Range
BM

Environment and Soils

This association was sampled at moderately high elevations in the Wallowa Mountains. Plot slopes are steep and valleys are very young, relatively narrow and shallow drainageways down steep sideslopes of larger stream coarses. One sample site was along the main Minam River. Soils have very high coarse fragment contents. Water tables are close to the soil surface and remain well aerated throughout the growing season. Associated Rosgen stream types are A2, A3 and A4, and stream orders are 1 and 2.

Valley Environment	Average	Range
Elevation (ft)	5642	5148-6480
Plot Slope (%)	16	2-30
Valley Width (m)	50	20-65
Valley Gradient (%)	8	5-10
Valley Sideslopes (%)	25	15-45
Soil Characteristics		
Depth to 30% Coarse Fragments (cm)	16	0-64
Soil Surface Cover (%)		
Submerged	3	0-10
Bare Ground	10	5-20
Gravel	2	0-5
Rock	23	10-40
Cryptogam	5	1-15
Litter	58	35-70

Vegetation Composition

Sitka alder (averaging 2 m in height) forms an extremely dense overstory shrub canopy. Understory shrubs are sparse to absent. Common cowparsnip and broadleaf bluebells are the more abundant tall forbs over large patches of enchanter's nightshade and heart-leaved miner's lettuce and bare rock. Average height of tall forbs is 66 cm (ranging from 30 to 90 cm).

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Sitka alder (*Alnus viridus* spp. *sinuata*)	100	88	75-97
Sitka willow (*Salix sitchensis*)	50	4	3-5
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	100	2	1-4
PERENNIAL FORBS			
Common cowparsnip (*Heracleum lanatum*)	100	37	12-60
Sweet-scented bedstraw (*Galium trifolium*)	100	2	1-5
Heart-leaved miner's lettuce (*Montia cordifolia*)	75	17	2-30
Sharptooth angelica (*Angelica arguta*)	75	5	3-10
Large-leaf avens (*Geum macrophyllum*)	75	1	--
Enchanter's nightshade (*Circaea alpina*)	50	36	7-65
Violets (*Viola* spp.)	50	31	1-60
Broadleaf bluebells (*Mertensia ciliata*)	50	25	10-40
Western coneflower (*Rudbeckia occidentalis*)	50	5	1-5
Stinging nettle (*Urtica dioica*)	50	3	2-4

Adjacent Vegetation

Upland vegetation adjacent to sampled sites comprised Subalpine fir (*Abies lasiocarpa*) associations. Grand fir/Rocky Mountain maple (*Acer glabrum*) and poke knotweed (*Polygonum phytolaccaefolium*) meadows.

Successional Dynamics

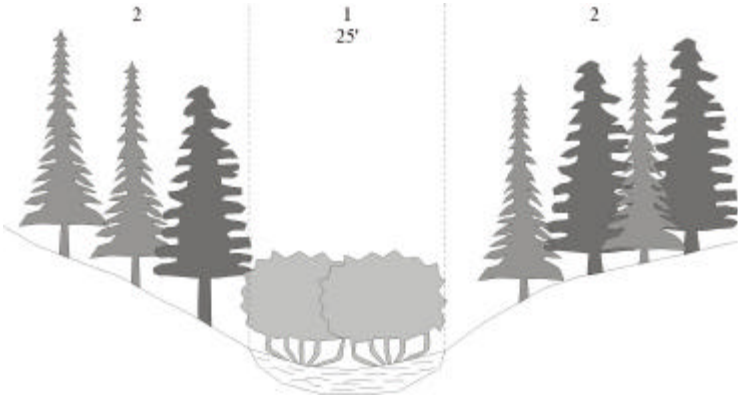
This association may be a successor to the Mixed Subalpine Forbs Association where sites have remained stable long enough for Sitka alder to become established.

Other Studies Documenting Association

none

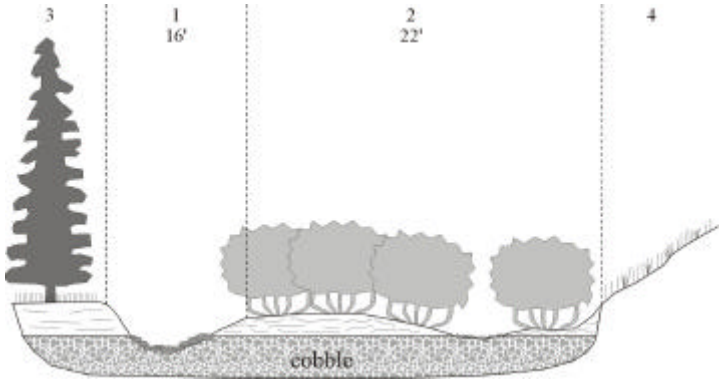
Illustrations

1 **Sitka alder/common cowparsnip Association**, banks and floodplain
2 Subalpine fir-Engelmann spruce, east- and west-facing sideslopes



Eagle Cap RD, Wallowa-Whitman NF; mod. gradient, mod. high elevation, V-shaped valley; Mesic Forest Province 2.

1 B3 Stream Reach
2 **Sitka alder/common cowparsnip**, alluvial bars and floodplain
3 Engelmann spruce terrace
4 Graminoid community, west-facing sideslope



Minam River, Eagle Cap RD, Wallowa-Whitman NF; low-mod. Gradient, moderate-high elevation, U-shaped valley; Mesic Forest Province 2.

Alnus viridus ssp. sinuata/Athyrium filix-femina Association

Sitka alder/Ladyfern Association
14 plots. CEGL001156

Ecoregional Range
BM, EC

Environment and Soils

The Sitka alder/Ladyfern Association is similar to the Mountain alder/Ladyfern Association. It occurs at slightly higher elevations and/or where snowpack in deeper and longer lasting in the Wallowa and northern Blue Mountains. Sites were sampled in the Walla Walla and Pomeroy RDs (Umatilla NF) and on the La Grande, Baker, and Hells Canyon NRA RDs (Wallowa-Whitman NF). Valley types in which this association is found are generally narrow and V-shaped with moderately steep side slopes but can occasionally be wide and flat. Valley gradients are moderately to very steep (2-20%). Fluvial surfaces on which this type occurs are floodplains, streambanks, and occasionally springs. Rosgen stream types associated with sampled sites are A2, A3, A4, B2, B3, and B4 and occasionally C3 and C4 on lower gradients. Stream orders are 1 and 2. Boulder, cobble, and gravel bedloads are predominant. Streams are usually 0.5-10 m wide with debris affecting 10-30% of the active channel. Soils are Endoaqepts, Humaquepts, and Endoaquolls. Textures are silt loam to sandy loam that grade into water-worked cobbles and gravel at the level of the old streambed. The soil remains relatively wet throughout the growing season. Sites are often flooded during peak runoff.

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt and mixed alluvium
Water Table Depth (cm)	18-77
Total Rooting Depth (cm)	10-38
Depth to Redoximorphic Features (cm)	0-25
Surface Layer	
Thickness (cm)	10-28
Texture(s)	silt loam, loam, sandy clay loam, sandy loam
Coarse Fragments (%)	0-30, gravel
Roots	very fine: many fine: few to many medium: few to common coarse: none to common
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	0-41+
Texture(s)	silt loam, sandy clay loam, medium sandy loam, gravelly sandy loam
Coarse Fragments (%)	10-60, gravel and/or cobble
Roots	very fine: none to many fine: few to many medium: few to common coarse: few to common
Redoximorphic Features	some iron oxidation and reduction
Substrate	sandy loam, gravelly sand, cobble, gravel

Valley Environment	Average	Range
Elevation (ft)	4571	3350-5640
Plot Slope (%)	10	1-70
Valley Width (m)	21	5-65
Valley Gradient (%)	6	2-10
Valley Sideslopes (%)	46	15-70
Soil Surface Cover (%)		Range
Submerged	2	0-10
Bare Ground	4	0-30
Gravel	1	0-5
Rock	1	0-12
Moss	27	1-76
Liverwort	2	0-20
Litter	61	1-98

Vegetation Composition

Sitka alder forms a dense canopy (averaging 3.5 m in height, ranging from 2.7-4.6 m) over a rich mixture of mesic forbs and graminoids. Lady fern is generally abundant with an average height of 62 cm, ranging from 30 to 90 cm. Stinking and prickly currant and thimbleberry make up a scattered understory shrub layer averaging 1 m tall. Wet forbs commonly found in this association include clasp-leaf twistedstalk, heart-leaved miner's lettuce, enchanter's nightshade, and alpine mitrewort. Drooping woodreed is the most frequently occurring graminoid.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Sitka alder (*Alnus viridus* spp. *sinuata*)	100	73	30-95
Prickly currant (*Ribes lacustre*)	79	9	1-45
Thimbleberry (*Rubus parviflorus*)	64	5	1-11
Stinking swamp currant (*Ribes hudsonianum*)	43	13	2-50
PERENNIAL GRASSES			
Drooping woodreed (*Cinna latifolia)*	92	5	1-35
PERENNIAL FORBS			
Sweet-scented bedstraw (*Galium trifolium*)	92	1	tr-2
Claspleaf twistedstalk (*Streptopus amplexifolius*)	86	7	1-50
Enchanter's nightshade (*Circaea alpina*)	86	6	1-45
Heart-leaved miner's lettuce (*Montia cordifolia*)	86	2	tr-10
Alpine mitrewort (*Mitella pentandra*)	79	30	1-90
Stinging nettle (*Urtica dioica*)	71	2	tr-5
Mountain sweet cicily (*Osmorhiza chilensis*)	71	1	1-2
FERNS and HORSETAILS			
Ladyfern (*Athyrium filix-femina*)	100	38	8-95
Oakfern (*Gymnocarpium dryopteris*)	43	42	2-70

Adjacent Vegetation

Vegetation types adjacent to sites sampled were:
terraces - grand fir/oakfern; subalpine fir/twinflower;
sideslopes - grand fir/queen's cup beadlily; subalpine fir/false bugbane; grand fir/oakfern, grand fir/twinflower, grand fir/Pacific yew/queen's cup beadlily; grand fir/big huckleberry (on upper slopes); and subalpine fir/queen's cup beadlily.

Successional Dynamics

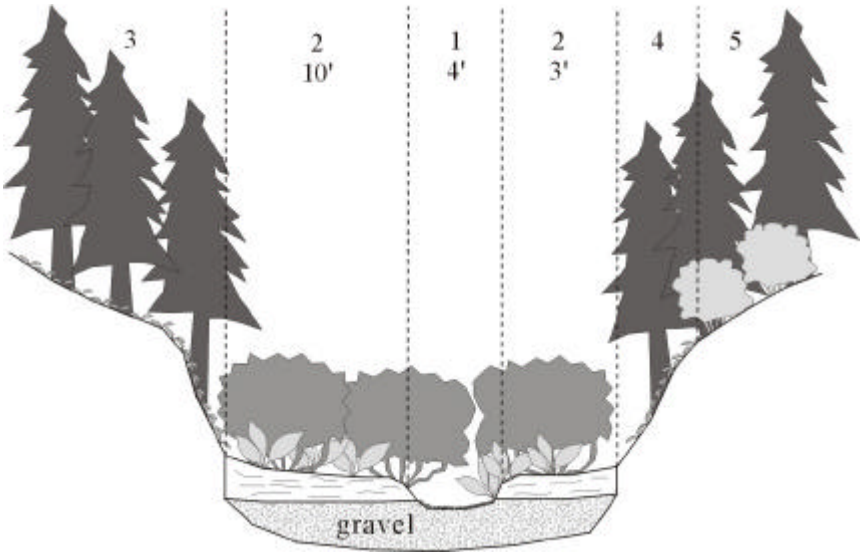
This association may develop on sites where the Ladyfern Association occurs if the sediments on the site remain stable long enough for Sitka alder to become established. If sites are converted from streambanks to high floodplains, the potential vegetation on the site will probably succeed to Grand fir/Ladyfern. The water table must still be close to the soil surface for this coniferous type to be maintained.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997: 122
Washington: Kovalchik 2001

Illustrations

1 A4 stream reach
2 **Sitka alder/ladyfern**, banks and floodplain
3 Grand fir/queen's cup beadlily, south-facing toeslope
4 Grand fir/queen's cup beadlily, north-facing toeslope
5 Grand fir/big huckleberry, north-facing sideslope



Crazyman Creek, Hell's Canyon NRA, Wallowa-Whitman NF; mod. gradient, mod. high elevation, V-shaped valley; Mesic Forest Province 2.

Alnus viridus ssp. sinuata/Cinna latifolia Association

Sitka alder/Drooping Woodreed Association
7 plots. New type

Ecoregional Range
BM

Environment and Soils
The Sitka alder/Drooping Woodreed Association occurs at in the northern half of the Blue Mountains. Valley types in which this association is found are generally narrow and V-shaped with moderately steep to very steep side slopes. Valley gradients are moderately to very steep. Fluvial surfaces on which this type occurs are floodplains, streambanks, and gravel bars. Stream reach types are Rosgen A2, A3 and B3, and stream orders are 1 and 2. Boulder and cobble bedloads are predominant. Streams are 0.5-4.5 m wide with debris affecting 0- >50% of the active channel. Than association has much shallower depths to the buried streambed than does the Sitka alder/Ladyfern Association. Soils are Endoaqepts, Humaquepts, and Endoaquolls. Textures are silt loam to sandy loam that grade into water-worked cobbles and gravel at the level of the old streambed. The soil remains relatively wet throughout the growing season. Sites are often flooded during peak runoff.

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt, glacial moraines
Water Table Depth (cm)	46
Total Rooting Depth (cm)	10-40
Depth to Redoximorphic Features (cm)	20
Surface Layer	
Thickness (cm)	10-13
Texture(s)	loam, sandy loam, fine sand, hemic organic
Coarse Fragments (%)	0-20, gravel
Roots	very fine: many fine: many medium: none to many coarse: none
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	0-52
Texture(s)	loam
Coarse Fragments (%)	0-30, gravel
Roots	very fine: none to many fine:none to many medium: none coarse: few
Redoximorphic Features	some iron oxidation
Substrate	coarse sand, gravel, cobbles, boulders

Valley Environment	Average	Range
Elevation (ft)	4712	3550-6740
Plot Slope (%)	10	1-28
Valley Width (m)	48	5-200
Valley Gradient (%)	6	2-10
Valley Sideslopes (%)	53	15-70
Soil Surface Cover (%)		
Submerged	3	0-15
Bare Ground	1	0-2
Gravel	2	0-10
Rock	3	0-7
Moss	21	5-50
Liverwort	1	0-5
Lichen	tr	0-1
Litter	60	27-93

Vegetation Composition

Sitka alder dominates the shrub canopy (with an average height of 2.5 m, ranging from 2-3 m) over a rich mixture of graminoids and wet forbs. The canopy is not as dense as in the Sitka alder/Ladyfern and Sitka alder/Common cowparsnip Associations. Drooping woodreed is generally abundant and is about 1 m tall. Stinking and prickly currant and thimbleberry make up a scattered understory shrub layer averaging 1 m tall. Wet forbs include brook saxifrage, coolwort foamflower, enchanter's nightshade, and large-leaf avens. Tall mannagrass is also frequently found in the herbaceous layer.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE UNDERSTORY			
Grand fir (*Abies grandis*)	67	1	--
Engelmann spruce (*Picea engelmannii*)	50	4	3-6
SHRUBS			
Sitka alder (*Alnus viridus* spp. *sinuata*)	100	38	10-65
Stinking swamp currant (*Ribes hudsonianum*)	67	17	1-60
Prickly currant (*Ribes lacustre*)	67	7	5-11
Thimbleberry (*Rubus parviflorus*)	67	2	1-4
Red raspberry (*Rubus idaeus*)	50	12	1-20
PERENNIAL GRASSES			
Drooping woodreed (*Cinna latifolia)*	100	20	5-80
Tall mannagrass (*Glyceria striata*)	67	12	1-40
PERENNIAL FORBS			
Brook saxifrage (*Saxifraga odontoloma*)	83	5	1-20
Sweet-scented bedstraw (*Galium trifolium*)	83	2	1-4
Oneleaf foamflower (*Tiarella trifoliata* var. *unifoliata*)	67	6	1-20
Enchanter's nightshade (*Circaea alpina*)	67	4	1-12
Large-leaf avens (*Geum macrophyllum*)	67	2	1-5
Claspleaf twistedstalk (*Streptopus amplexifolius*)	67	2	1-4
Sharptooth angelica (*Angelica arguta*)	67	2	1-4
Alpine mitrewort (*Mitella pentandra*)	67	2	1-3
Arrowleaf groundsel (*Senecio triangularis*)	67	1	1-3

Adjacent Vegetation

Vegetation types adjacent to sites sampled were:
terraces - grand fir/oakfern; subalpine fir/twinflower;
sideslopes - subalpine fir/queen's cup beadlily; subalpine fir/twinflower; grand fir/queen's cup beadlily; and other grand fir associations.

Successional Dynamics

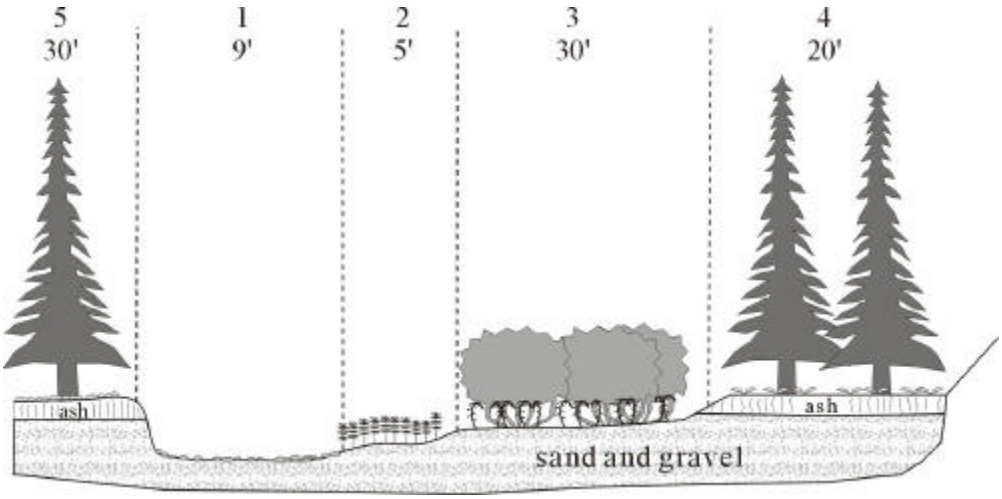
The relationship among the Sitka alder/Drooping woodreed and the Prickly currant-Stinking swamp currant/ Drooping woodreed associations is not clear. The prickly currant-stinking swamp currant/Drooping woodreed association, however, may sometimes be seral to the Sitka alder/Drooping woodreed association on sites where sediments remain stable long enough for Sitka alder to become established. Opening up of the adjacent upland conifer canopy may also help promote Sitka alder establishment.

Other Studies Documenting Association

none

Illustrations

1 C4 stream reach
2 **Common horsetail**, point bar
3 **Sitka alder/drooping woodreed**, floodplain
4 Subalpine fir/queen's cup beadlily, terrace
5 Subalpine fir/twinflower, terrace



N. Fk. Cable Creek, North Fork John Day RD, Umatilla NF; mod. low gradient, mod. elevation, V-shaped valley.

Salix melanopsis Association

Dusky willow Association
9 plots. New type

Ecoregional Range
BM, BR, EC?

Environment and Soils
The dusky willow association occurs at moderate to high elevations above the range of coyote willow. Sites were sampled in the Wallowa Mountains and in Lake County. This association is found on cobbly alluvial bars and banks adjacent to B3 and D4 Rosgen stream reach types. Valleys are moderate gradient (all but one valley ranged from 1-3% slope), narrow to moderately wide, flat- (most valleys), V-, U-, and trough-shaped with gentle to steep side slopes. Streams are 1.5-35 m wide. Throughout the growing season, the water table is within or near the rooting zone of coyote willow. Soils are sandy-skeletal Entisols, composed primarily of water-worked cobbles and some gravel. Occasionally, there are 10-20 cm of sand overlying the sandy-skeletal material. Sites are flooded during spring runoff, but water recedes by late spring.

Valley Environment	Average	Range
Elevation (ft)	4671	3180-6940
Plot Slope (%)	7	1-30
Valley Width (m)	116	20-350
Valley Gradient (%)	3	2-10
Valley Sideslopes (%)	44	15-70
Soil Characteristics		
Depth to 80% Coarse Fragments (cm)	7	0-20
Soil Surface Cover (%)		
Submerged	1	0-5
Bare Ground	27	2-60
Gravel	5	0-15
Rock	27	0-60
Cryptogam	6	0-25
Litter	31	5-89

Vegetation Composition
Dusky willow forms a dense shrub canopy over scattered forbs and graminoids whose total cover probably varies yearly with flooding. The willow canopy averages 1.5 m in height (ranging from 1 to 2.5 m). Understory shrubs are scattered and average 40cm in height (ranging from 15 to 62 cm in height). The herbaceous layer varies from scattered to relatively continuous depending on the density of dusky willow. Average height of herbaceous vegetation is 27 cm, ranging from 15 to 46 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE UNDERSTORY			
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	40	8	5-15
Engelmann spruce (*Picea engelmannii*)	40	8	1-20
SHRUBS			
Dusky willow (*Salix melanopsis*)	100	72	50-90
MacKenzie's willow (*Salix prolixa*)	50	14	2-30
Shrubby cinquefoil (*Potentilla fruticosa*)	40	3	1-5
Drummond's willow (*Salix drummondii*)	20	9	8-10
SEDGES and RUSHES			
Smallwing sedge (*Carex microptera*)	40	2	1-5
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	50	3	1-11
Creeping bentgrass (*Agrostis stolonifera*)	40	16	1-40
Kentucky bluegrass (*Poa pratensis*)	40	5	1-10
PERENNIAL FORBS			
Yarrow (*Achillea millefolium*)	60	1	--
Prairie sage (*Artemisia ludoviciana*)	50	4	1-10
Western coneflower (*Rudbeckia occidentalis*)	50	2	1-4
Eaton's aster (*Aster eatonii*)	40	4	1-7
Rocky Mountain grass of Parnassus (*Parnassia fimbriata*)	40	3	1-8
Pearly everlasting (*Anaphalis margaritacea*)	40	2	1-3
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	60	10	1-30
ANNUAL and BIENNIAL FORBS			
Bull thistle (*Cirsium vulgare*)	50	2	1-5

Adjacent Vegetation

Vegetation types adjacent to sites sampled in the Wallowa Mountains are:
terraces: Grand fir associations;
sideslopes: grand fir/Geyer's sedge (*Carex geyeri*), grand fir/pinegrass (*Calamagrostis rubescens*), Engelmann spruce associations, Hood's sedge (*Carex hoodii*) meadows, subalpine fir/grouse huckleberry and common snowberry-mallow ninebark-shrubby cinquefoil (*Dasiphora floribunda*) communities.

Successional Dynamics

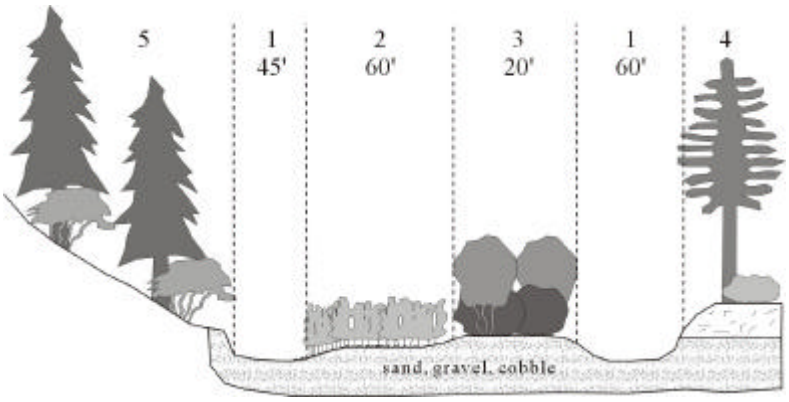
Succession to another association is unlikely if flooding and sediment erosion/deposition regimes remain in a stable equilibrium on the fluvial landforms, alluvial bars and streambanks, on which this association occurs. It is possible that black cottonwood (*Populus balsamerifera* ssp. *trichocarpa*) seedlings may become established on some sites at lower elevations with gentler gradients (>= 2%), in which case those sites may succeed to one of the black cottonwood associations.

Other Studies Documenting Association with Plot Data

Washington: Kerr 2000

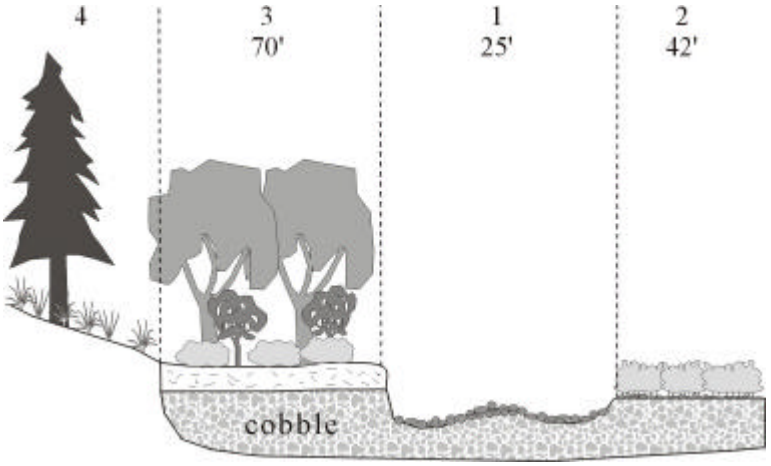
Illustrations

1 D3 stream channels
2 **Coyote willow**, alluvial bar
3 **Mountain alder-red-osier dogwood/mesic forb**, floodplain
4 **Douglas-fir/common snowberry-floodplain**, terrace
5 Grand fir/Rocky Mtn. maple, west-facing sideslope



Eagle Creek, Pine RD, Wallowa-Whitman NF; mod. gradient, mod. low elevation, flat-shaped valley

1 D3 stream reach
2 **Coyote willow**, alluvial bar
3 **Black cottonwood/common snowberry**, inactive floodplain
4 Grand fir/pinegrass, west-facing sideslope



East Eagle Creek, Pine RD, Wallowa-Whitman NF; mod. gradient, mod. elevation, flat-shaped valley.

SUBALPINE / ALPINE WILLOW GROUP

Information about the Subalpine/Alpine Willow Group

There are several associations that are designated in this group. Each has one or two willow species designated in the association name. These willow species are Undergreen willow (*Salix commutata*), Booth willow (*Salix boothii*), Blueberry willow (*Salix myrtillifolia*), Eastwood willow (*Salix eastwoodiae*) and Tweedy's willow (*Salix* tweedyi). The evidence, however, shows that these willows have similar ecological niches and could, in fact, be grouped into one subalpine/alpine cold environment group. More information in the future on all of the subalpine areas in central and eastern Oregon may elucidate further refinements in the ecological niches of each of these species.

A more practical way to group these associations would be to look at three important factors:

1. the landform on which they occur;
2. the groundwater hydrology of the site (especially the height of the water table throughout the growing season); and
3. the texture of the surface horizons of the soils, which affects the water holding capacity and the availability of water to herbaceous species in particular.

Thus the sequence of association would be from wettest to driest surface horizon:

Subalpine willow/Bladder sedge – meadow landforms; organic soils; season-long high water tables

Subalpine willow/Aquatic sedge – meadow and spring landforms; organic and fine-textured mineral soils; late growing season high water tables

Subalpine willow/Holm's sedge – meadow, floodplain and spring landforms; organic and fine-textured mineral soils; late growing season high water tables

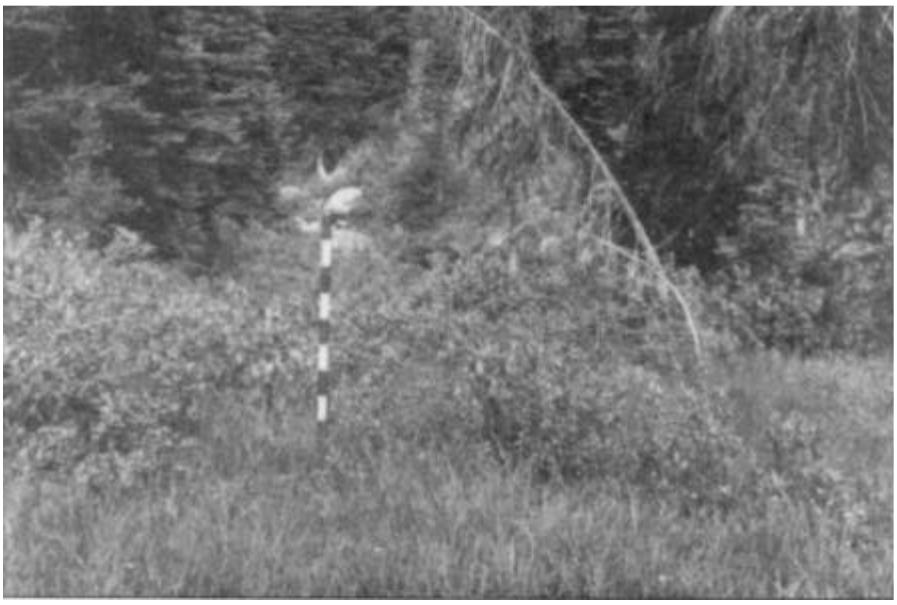
Subalpine willow/Bluejoint reedgrass – floodplain landforms; fine-textured soils; mid growing season high water tables

Subalpine willow/Tufted hairgrass – meadow landforms; fine-textured soils with moderate to high water holding capacity in surface layers; mid growing season high water tables

Subalpine willow/Black alpine sedge – meadow land forms, coarse-textured soils with low water holding capacity in surface layers; early growing season high water table

Salix commutata-Salix eastwoodiae/Carex scopulorum Association

Undergreen willow-Eastwood willow/Holm's sedge Association
9 plots. CEGL001189



Ecoregional Range
BM, BR?, EC

Environment and Soils
The undergreen willow/Holm's sedge association is common at high elevations in the Blue Mountains and East Cascades and may occur on Steens Mountain as well. It is found in wet meadow, on narrow floodplains along streams and on seep slopes. Soils in wet meadows are cold, organics (Saprists and Hemists). Soils on floodplains are mineral soils with silt loam or sandy loam surface and subsurface layers. All soils are saturated for much of the growing season, although standing water is seldom seen on the surface. Substrates underlying soils are pumice, basalt, granite and quartz diorite. Where streams were present adjacent to sample sites, they ranged from A2 to B3 to E5 Rosgen types.

Valley Environment	Average	Range
Elevation (ft)	6520	6080-6950
Plot Slope (%)	13	1-40
Valley Width (m)	95	20-200
Valley Gradient (%)	5	2-10
Valley Sideslopes (%)	53	45-70
Soil Characteristics		
Depth to Wet Soil (cm)	0	--
Water Table Depth (cm)	29	10-41
Depth to Redoximorphic features (cm) in mineral soils	4	0-8
Soil Surface Cover (%)		
Submerged	5	0-20
Bare Ground	25	0-80
Rock	1	0-10
Cryptogam	43	5-96
Litter	22	0-50

Vegetation Composition
Undergreen willow or Eastwood willow forms a scattered to dense shrub overstory averaging 110 cm in height (ranging from 50 to 185 cm) with a dense layer of Holm's sedge, scattered forbs and graminoids in the understory. Average height of herbaceous vegetation is 37 cm (ranging from 30-50 cm). Moss cover is continuous or at least very extensive on wet meadow sites.

Adjacent Vegetation
Vegetation types adjacent to sites sampled are:
terraces – subalpine fir/Labrador tea (*Ledum glandulosum*)-grouse huckleberry (*Vaccinium scopulorum*); and other subalpine fir and mountain hemlock (*Tsuga mertensiana*) associations and lodgepole pine communities
sideslopes - subalpine fir/grouse huckleberry, subalpine fir/Labrador tea-grouse huckleberry, and other subalpine fir and mountain hemlock (*Tsuga mertensiana*) associations and lodgepole pine communities.

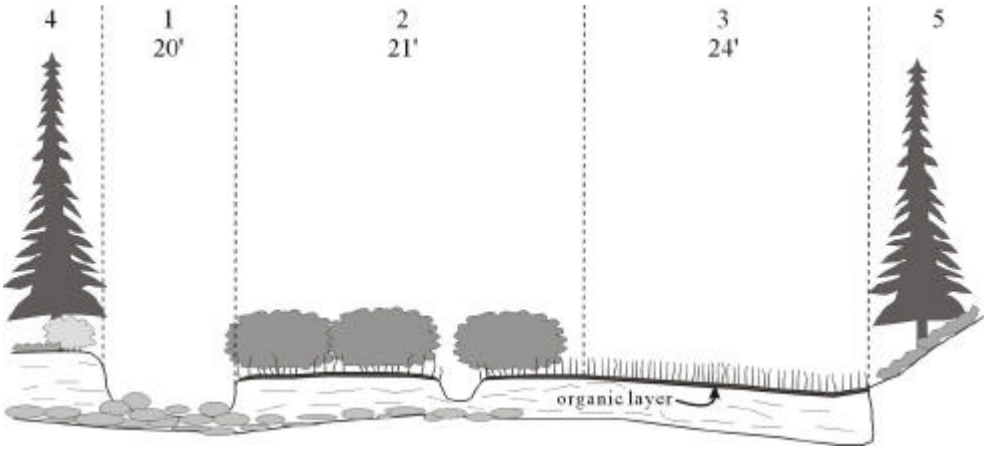
Successional Dynamics
Where soils are organic this association is fairly stable and self-perpetuating. Where sites are floodplains and soils are mineral, large flood events will cause scour and deposition. Sites may be geomorphically changed from floodplains to terraces and develop subalpine fir associations.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE UNDERSTORY			
Subalpine fir (*Abies lasiocarpa*)	56	3	0-5
SHRUBS			
Undergreen willow (*Salix commutata*)	89	53	15-95
Eastwood willow (*Salix eastwoodiae*)	11	18	--
Drummond willow (*Salix drummondiana*)	11	80	--
Sitka willow (*Salix sitchensis*)	11	20	--
SEDGES and RUSHES			
Holm's sedge (*Carex scopulorum*)	100	46	22-96
Swordleaf rush (*Juncus ensifolius*)	33	1	--
Densely-tufted sedge (*Carex lenticularis*)	22	11	2-20
PERENNIAL GRASSES			
Bluejoint reedgrass (*Calamagrostis canadensis*)	44	10	1-30
Thurber's bentgrass (*Agrostis thurberiana*)	33	2	2-3
PERENNIAL FORBS			
Fan-leaved cinquefoil (*Potentilla flabellifolia*)	56	1	tr-5
Elephant's head (*Pedicularis groenlandica*)	56	1	tr-1
Arrowleaf groundsel (*Senecio triangularis*)	44	7	1-20
Alpine meadow butterweed (*Senecio cymbalarioides*)	44	5	1-10
Slender bog-orchid (*Habenaria saccata*)	44	tr	tr-1
Meadow arnica (*Arnica chamissonis*)	33	8	1-20
Brook saxifrage (*Saxifraga odontoloma*)	33	7	1-13

Other Studies Documenting Association with Plot Data
Oregon: Kovalchik (1987); Murray (2000) describes an undergreen willow association that includes undergreen willow/Holm's sedge sites.
Washington: Kovalchik (2001)

Illustrations

1 B3 stream reach
2 **Undergreen willow/Holm's sedge**, floodplain
3 **Holm's sedge**, overflow swale
4 **Subalpine fir/Labrador tea**, terrace
5 Subalpine fir/grouse huckleberry, northeast-facing sideslope



East Lostine River, Eagle Cap RD, Wallowa-Whitman NF; mod. gradient, high elevation, U-shaped valley.

Salix boothii- Salix myrtillifolia /Carex scopulorum Association

Blueberry willow-Booth willow/Holm's sedge Association
11 plots. New type

Ecoregional Range
BM, BR?, EC

Environment and Soils
This association occurs on wet meadows, and on streambanks and floodplains. Sites are more consistently gentle slopes than those of the Undergreen willow/Holm's sedge Association. Where streams were adjacent to sites sampled they were C4, E4 and DA4 Rosgen types. All soils sampled have either organic rich mineral surface layers (Mollisols) or organic surface layers (fibric) over silt loam to loamy coarse sand subsurface layers. Soils are wet through much of the growing season.

Valley Environment	Average	Range
Elevation (ft)	7228	6080-7790
Plot Slope (%)	1	1-3
Valley Width (m)	70	20-200
Valley Gradient (%)	2	--
Valley Sideslopes (%)	41	15-70
Soil Characteristics		
Depth to Wet Soil (cm)	0	--
Water Table Depth (cm)	34	20-48
Depth to Redoximorphic Soils (cm)	15	10-20
Soil Surface Cover (%)		
Submerged	4	0-15
Bare Ground	20	0-80
Cryptogam	34	10-65
Litter	38	2-65

Vegetation Composition
Booth willow, in a dwarfed form, or blueberry willow form a moderately dense to extremely dense shrub overstory averaging 65 cm in height (ranging from 40 to 120 cm). Holm's sedge (averaging 25-33 cm in height) is always present and usually the dominant understory species. Under nearly closed shrub canopies, forbs dominate the herbaceous layer (averaging 12 cm in height).

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Booth willow (*Salix boothii*)	91	71	30-90
Blueberry willow (*Salix myrtillifolia*)	9	70	--
SEDGES and RUSHES			
Holm's sedge (*Carex scopulorum*)	100	49	5-85
Bladder sedge (*Carex utriculata*)	27	12	1-25
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia cespitosa*)	36	3	1-10
PERENNIAL FORBS			
Fan-leaved cinquefoil (*Potentilla flabellifolia*)	73	22	1-80
Alpine meadow butterweed (*Senecio cymbalarioides*)	55	13	1-40
Idaho licoriceroot (*Ligusticum tenuifolium*)	45	2	1-5
Explorer's gentian (*Gentiana calycosa*)	27	9	1-25
Alpine shooting star (*Dodecatheon alpinum*)	27	4	1-10
Subalpine daisy (*Erigeron peregrinus* ssp. *callianthemus*)	27	3	1-5

Adjacent Vegetation
terraces: subalpine fir (*Abies lasiocarpa*)/red mountain-heath (*Phyllodoce empetriformis*) and red mountain-heath-dwarf huckleberry (*Vaccinium caespitosum*) communities;
sideslopes: subalpine fir/red mountain-heath-grouse huckleberry (*Vaccinium scopulorum*), subalpine fir/Labrador tea (*Ledum glandulosum*)-grouse huckleberry and other subalpine fir associations.

Successional Dynamics
Sites are unlikely to undergo succession to another association unless soil water relations change and sites become either much drier. In this case, the sites may transition to subalpine fir associations.

Other Studies Documenting Association - none

Salix eastwoodiae-Salix boothii/Carex aquatilis Association

Eastwood willow-Booth willow/Aquatic sedge Association
5 plots. CEGL001195 = *Salix eastwoodiae/Carex aquatilis*

Ecoregional Range
BM, EC

Environment and Soils
Sites were sampled in the Wallowas, Ochocos, East Cascades and Gearhardt Mountain. Four sites have mineral soils with surface horizons ranging from hemic organic to silt loam to coarse sand and one site has a 100 cm thick organic soil (sapric histosol). Rooting zones of all sites are wet to saturated thoughout the growing season.

Valley Environment	Average	Range
Elevation (ft)	6224	5000-7700
Plot Slope (%)	4	1-7
Valley Width (m)	54	20-65
Valley Gradient (%)	3	2-5
Valley Sideslopes (%)	30	15-45
Soil Characteristics		
Depth to Wet Soil (cm)	10	0-38
Water Table Depth (cm)	22	0-52
Depth to Redoximorphic Features (cm)	10	4-17
Depth to 50% Coarse Fragments (cm)	80	38-112
Soil Surface Cover (%)		
Submerged	2	0-5
Bare Ground	17	5-45
Cryptogam	39	10-60
Litter	47	0-90

Vegetation Composition
Eastwood willow or booth willow (in dwarf form) create a scattered to very dense shrub overstory averaging 1 m in height (ranging from 90 cm to 1.2 m). The understory is dominated by aquatic sedge with grasses, graminoids and forbs scattered throughout the sites. Average herbaceous height is 55 cm (ranging from 40 to 68 cm).

Adjacent Communities
Upland vegetation on sideslopes adjacent to sites sampled includes: Grand fir/grouse huckleberry, grand fir/ grouse huckleberry/ pinegrass; and other subalpine fir associations.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Eastwood willow (*Salix eastwoodiae*)	80	26	15-45
Booth willow (*Salix boothii*)	20	92	--
Bog birch (*Betula nana*)	40	18	15-20
Tweedy's willow (*Salix tweedyi*)	20	22	--
SEDGES and RUSHES			
Aquatic sedge (*Carex aquatilis*)	100	62	25-95
Jones' sedge (*Carex jonesii*)	60	12	1-30
Baltic rush (*Juncus balticus*)	40	3	tr-5
Small-winged sedge (*Carex microptera*)	40	1	--
Golden sedge (*Carex aurea*)	40	tr	tr-1
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia cespitosa*)	60	1	tr-4
Tall mannagrass (*Glyceria striata*)	40	8	tr-15
PERENNIAL FORBS			
Western polemonium (*Polemonium occidentale*)	80	3	1-5
Bog saxifrage (*Saxifraga oregana*)	60	2	tr-5
Large-leaf avens (*Geum macrophyllum*)	60	1	tr-2
Longstalk clover (*Trifolium longipes*)	60	1	1-2
Western yarrow (*Achillea millefolium*)	60	tr	tr-1

Successional Dynamics
Sites are unlikely to undergo succession under stable environmental conditions. If soil water relations change and water tables do not remain in the upper layers of the soil during the growing season, sites may transition to subalpine fir associations.

Other Studies Documenting Association
none

Salix eastwoodiae-Salix commutata/Carex utriculata Association

Eastwood willow-undergreen willow/Bladder sedge Association
3 plots. CEGL001196 = *Salix eastwoodiae / Carex utriculata*

Ecoregional Range
BM, EC?

Environment and Soils
Two of the three plots have organic soils (hemic and fibric histosols). One plot has a mineral soil with an thin (10 cm thick) histic surface layer. The water table is close to the soil surface and within the rooting zone throughout the growing season.

Valley Environment	Average	Range
Elevation (ft)	5577	4650-6080
Plot Slope (%)	3	15-45
Valley Width (m)	155	65-200
Valley Gradient (%)	4	2-5
Valley Sideslopes (%)	25	15-45
Soil Characteristics		
Depth to Current Water Tables (cm)	10	0-20
Rooting Depth (cm)	41	32-49
Soil Surface Cover (%)		
Submerged	8	0-15
Bare Ground	3	0-10
Rock	1	0-3
Cryptogam	22	0-51
Litter	66	34-100

Vegetation Composition
Eastwood willow, sometimes together with undergreen willow form the shrub overstory (averaging 90 cm in height). On one site, bog birch was somewhat abundant. A sward of bladder sedge dominates the herbaceous ayer (averaging 60 cm in height).

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Eastwood willow (*Salix eastwoodiae*)	100	38	15-60
Undergreen willow (*Salix commutata*)	33	20	--
Bog birch (*Betula nana*)	33	25	--
SEDGES and RUSHES			
Bladder sedge (*Carex utriculata*)	100	58	35-90
Aquatic sedge (*Carex aquatilis* var. *aquatilis*)	67	30	10-50
Baltic rush (*Juncus balticus*)	67	3	tr-5
Jones' sedge (*Carex jonesii*)	67	3	tr-5
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia cespitosa*)	67	1	tr-1
PERENNIAL FORBS			
Western polemonium (*Polemonium occidentale*)	67	4	2-5
Streambank butterweed (*Senecio pseudareus*)	67	3	1-5
Bog saxifrage (*Saxifraga oregana*)	67	3	1-5

Adjacent Vegetation
Upland vegetation adjacent to this association comprises Subalpine fir (*Abies lasiocarpa*)/Grouse huckleberry (*Vaccinium scoparium*) and other subalpine fir associations.

Successional Dynamics
Sites are unlikely to undergo succession under stable environmental conditions. If soil water relations change and soils are saturated for a shorter time during the growing season, sites may transition to the undergreen willow/Holm's sedge association.

Nearby Studies Documenting Association
none

Salix boothii-Salix commutata/Calamagrostis canadensis Association

Booth willow-undergreen willow/Bluejoint reedgrass Association
3 plots. New type

Valley Environment	Average	Range
Elevation (ft)	7110	7060-7140
Plot Slope (%)	1	1-2
Valley Width (m)	95	20-200
Valley Gradient (%)	2	--
Sideslope Gradient (%)	52	15-70
Soil Characteristics		
Depth to Wet Soil (cm)	26	22-30
Water Table Depth (cm)	69	45-93
Rooting Depth (cm)	32	22-40
Soil Surface Cover (%)		
Bare Ground	3	0-5
Cryptogam	19	3-50
Litter	73	45-94

Ecoregional Range
BM, EC?

Environment and Soils
This association occurs on floodplains adjacent to Rosgen C4 and E4 streams. They are periodically flooded by gentle spring runoff and deposition of silt, which encourages the establishment and perpetuation of the bluejoint reedgrass on the site. Soils are wet to the surface in the spring during high water flows and snowmelt. Water tables drop to below the rooting zone by the mid to late growing season.

Vegetation Composition
Booth or undergreen willow comprise the shrub layer, which averages 80 cm in height (ranging from 50 to 110 cm). Bluejoint reedgrass, a rhizomatous species, dominates the understory and averages 33 cm in height (ranging from 32 to 36 cm). Several forbs occur at low to moderate cover in the lower herbaceous layer.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Booth willow (*Salix boothii*)	67	73	--
Undergreen willow (*Salix commutata*)	33	85	--
SEDGES and RUSHES			
Holm's sedge (*Carex scopulorum*)	100	7	3-12
PERENNIAL GRASSES			
Bluejoint reedgrass (*Calamagrostis canadensis*)	100	68	45-90
Tufted hairgrass (*Deschampsia cespitosa*)	100	5	1-10
Alpine timothy (*Phleum alpinum*)	67	1	--
PERENNIAL FORBS			
Fan-leaved cinquefoil (*Potentilla flabellifolia*)	100	14	2-30
Idaho licoriceroot (*Ligusticum tenuifolium*)	100	3	1-5
Subalpine daisy (*Erigeron peregrinus* ssp. *callianthemus*)	67	5	1-10
Explorer's gentian (*Gentiana calycosa*)	67	1	--
Elephant's head (*Pedicularis groenlandica*)	67	1	--
Meadow arnica (*Arnica chamissonis*)	67	1	--
Payette beardtoungue	33	60	--

Adjacent Communities
Upland vegetation adjacent to sites sampled included: terraces: subalpine fir/Red mountain-heath; sideslopes: subalpine fir/Labrador tea-grouse huckleberry and other subalpine fir associations.

Successional Dynamics
Sites are unlikely to undergo succession under stable environmental conditions. If soil water relations change and water tables remain within upper soil horizons for long periods during the growing season, sites may transition to either the Booth willow/Holm's sedge or the undergreen willow/Holm's sedge association.

Nearby Studies Documenting Association
none

Salix boothii/Deschampsia cespitosa Association

Booth willow/Tufted hairgrass Association
3 plots. CEGL002904

Valley Environment	Average	Range
Elevation (ft)	7347	7120-7790
Plot Slope (%)	5	1-12
Soil Characteristics		
Depth to Wet Soil (cm)	27	7-50
Depth to Redoximorphic Features (cm)	21	15-25
Rooting Depth (cm)	33	28-42
Soil Surface Cover (%)		
Bare Ground	17	10-30
Gravel	3	0-8
Cryptogam	30	20-40
Litter	30	10-40

Ecoregional Range
BM, EC?

Environment and Soils
This association is found in U-shaped valleys that are moderately wide to side with moderate gradients. All sites were meadow complexes, and two had Rosgen E4 streams meandering widely through them. Sites are on drier edges or raised areas of meadows where water tables do not remain high enough in the soil profile through the growing season to support Holm's sedge as the dominant understory species. Soils are mineral with silt loam and loam surface horizon textures.

Vegetation Composition
Booth willow is the shrub layer dominant and averages 60 cm in height, ranging from 40 to 90 cm. Tufted hairgrass and a variety of forbs comprise the herbaceous understory, which averages 20 cm in height, ranging from 13 to 31 cm. Forbs are greater in cover on sites that receive more ground disturbance from grazing animals and/or frost heaving and soil erosion.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Booth willow (*Salix boothii*)	100	52	22-75
SEDGES and RUSHES			
Holm's sedge (*Carex scopulorum*)	100	6	1-15
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia cespitosa*)	100	20	10-30
Slender muhly (*Muhlenbergia filiformis*)	100	11	1-30
Alpine timothy (*Phleum alpinum*)	100	1	--
PERENNIAL FORBS			
Fan-leaved cinquefoil (*Potentilla flabellifolia*)	100	30	15-60
Elephant's head (*Pedicularis groenlandica*)	100	1	--
Alpine meadow butterweed (*Senecio cymbalarioides*)	67	23	5-40
Swamp onion (*Allium validum*)	67	21	1-40
Explorer's gentian (*Gentiana calycosa*)	67	18	5-30
Alpine shooting star (*Dodecatheon alpinum*)	67	7	1-40

Adjacent Communities
Upland vegetation on sideslopes adjacent to sites sampled comprises subalpine fir associations.

Successional Dynamics
Sites are unlikely to undergo succession under stable environmental conditions. If soil water relations change and water tables remain within upper soil horizons for long periods during the growing season, sites may transition to either the Booth willow/Holm's sedge or the undergreen willow/Holm's sedge association.

Nearby Studies Documenting Association
none

*Salix eastwoodiae-Salix myrtillifolia/Carex nigricans Association**

Eastwood willow-blueberry willow/Black alpine sedge Association
2 plots. CEGL002607

Ecoregional Range
BM, EC

Environment and Soils
Two plots were sampled at high elevations (6510 ft.) in the Three Sisters Wilderness Area. Sites are on glacial outwash floodplains on the west and north sides of Green Lakes. Soils are sandy skeletal.

Valley Environment	Average	Range
Plot Slope (%)	4	3-5
Soil Surface Cover (%)		
Bare Ground	40	5-75
Gravel	7	3-10
Rock	3	1-5
Cryptogam	43	10-75
Litter	8	0-16

Vegetation Composition
The low shrub layer (30 to 90 cm tall) is dominated by Eastwood and Booth willows and also includes red mountain-heath and alpine laurel. The sparse undergrowth is dominated by black alpine sedge but includes other high elevation plants such as Holm's sedge, Drummond rush, few-flowered spikerush, little elephanthead, timber pussytoes, tofieldia and broadleaf lupine.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Eastwood willow (*Salix eastwoodiae*)	100	33	20-45
Blueberry willow (*Salix myrtillifolia*)	100	20	10-30
Red mountain-heath (*Phyllodoce empetriformis*)	100	8	1-15
Alpine laurel (*Kalmia microphylla*)	100	4	2-5
SEDGES and RUSHES			
Black alpine sedge (*Carex nigricans*)	100	18	15-20
Holm's sedge (*Carex scopulorum*)	100	5	3-7
Few-flowered spikerush (*Eleocharis quinqueflora*)	100	3	2-3
PERENNIAL GRASSES			
Mountain bentgrass (*Agrostis variabilis*)	100	6	5-7
PERENNIAL FORBS			
Broadleaf lupine (*Lupinus arcticus* ssp. *subalpinus*)	100	9	2-15
Attol lousewort (*Pedicularis attollens*)	100	5	--
Umber pussytoes (*Antennaria umbrinella*)	100	1	1-2
Sticky tofieldia (*Tofieldia glutinosa*)	100	1	--

Adjacent Communities
Sideslope vegetation adjacent to sites sampled are subalpine fir (*Abies lasiocarpa*) and mountain hemlock (*Tsuga mertensiana*) associations.

Nearby Studies Documenting Association with Plot Data
none

Vaccinium uliginosum/Eleocharis pauciflora Association

Bog blueberry/Few-flowered spikerush Association
10 plots. New type

Ecoregional Range
EC

Environment and Soils

Bog blueberry/few-flowered spikerush is abundant in the Deschutes Cascades and Winema CascadesPhysiographic Areas but is rare eastward. Sites are poor fens (i.e. they have lower nutrient levels than other fens) developed in zones of abundant rain-fall (more than 39 inches/year). Poor fens are flat, cold, and poorly-drained landforms that are conducive to peat soil development (Graham 1957). The wet, coastal-influenced climate and irregular, glaciated topography of the Cascades help create many sites favorable for bog development. On the Fremont and Ochoco National Forests these requirements are met only in some of the higher mountains such as Pisgah Meadows and Gearhart Mountain. The association was observed but not sampled at Gearhart Marsh.

Bog blueberry/few-flowered spikerush sites are midway in soil moisture relationships between few-flowered spikerush and lodgepole pine-Engelmann spruce/few-flowered spikerush fens. Soils are deep wood, sedge, and moss peats. Peat formation is due to slow plant decomposition in water logged sites (Gorham 1957). Low dissolved oxygen, cold soil temperature, lack of fluctuation in the water table, plus concentrations of organic and mineral acids (tannins etc.) in the water table all contribute to slow decomposition. Dead residues from shrubs, graminoids, forbs, and mosses decompose less rapidly than the accumulation from seasonal growths and peat accumulates (Gorham 1957). Water tables are near to slightly above the soil surface season long and available water holding capacity is very high. Peat is like a sponge and may retain 10-20 times its own weight in water. Highly impermeable layers of decayed organic matter or clay subsoil may further retard water percolation.

Valley Environment	Average	Range
Elevation (ft)	5003	4660-5800
Plot Slope (%)	2	0-7
Valley Width (m)	3	1-7
Soil Surface Cover (%)		
Bare Ground	20	0-70
Cryptogam	63	20-98
Litter	17	2-30

Vegetation Composition

Dwarf shrubs such as bog blueberry, bog birch, alpine laurel, andEastwood, undergreen, and Booth willows dominate a herbaceous layer best characterized by few-flowered spikerush. Engelmann spruce and lodge-pole pine are scattered individuals or form small clumps but in total their cover is less than 25 percent. Occasionally they may form a dwarf forest (tree heights less than 6 m) with considerable canopy cover (up to 37 %). Few-flowered spikerush is usually codominant with other graminoids and forbs in the herb layer. Where it is inconspicuous, other herbaceous vegetation is consistent with the vegetative composition of the association. Moss is abundant. Tufted hairgrass is present on many plots but has low cover. Normally robust sedges such as Holm's, Sitka, or bladder sedge are dwarfed, scattered, and lack vigor but in total can have a fair canopy cover (5-20 percent). Muricate sedge occurs on most plots. There is a rich component of forbs, including sundew, white bog orchid, shooting star, elephant head, western bistort, swamp whitehead, hooded ladies-tresses,t ofieldia, common horsetail, western St. Johns-wort, and primrose monkey flower.

On sites with undulating topography, the depressions (water paths) may be quite different from the slightly elevated hummocks. Water paths often have little moss cover and are dominated by litter or organic soil. Few-flowered spike-rush is the dominant herb in the water paths. Great sundew grows in the water paths while common sundew grows on the edges of hummocks. Aquatic plants such as bog buckbean and flatleaved bladderwort grow in the water paths during highwater. Shrubs are found primarily on the hummocks along with conspicuous amounts of moss, taller sedges, and forbs.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-SUBDOMINANTS			
Lodgepole pine (*Pinus contorta*)	80	7	1-15
TREE UNDERSTORY			
Lodgepole pine (*Pinus contorta*)	100	4	1-10
Engelmann spruce (*Picea engelmannii*)	40	2	1-3
SHRUBS			
Bog blueberry (*Vaccinium occidentale*)	100	36	20-60
Eastwood willow (*Salix eastwoodiae*)	60	11	3-20
Alpine laurel (*Kalmia microphylla*)	50	9	5-15
Booth willow (*Salix boothii*)	50	3	1-5
Sweetberry honeysuckle (*Lonicera caerulea*)	40	6	1-15
Bog birch (*Betula nana*)	30	22	17-30
SEDGES and RUSHES			
Few-flowered spikerush (*Eleocharis quinqueflora*)	100	17	1-40
Star sedge (*Carex echinata*)	70	14	1-63
Bladder sedge (*Carex utriculata*)	70	10	3-20
Sitka sedge (*Carex aquatilis* var. *dives*)	60	6	3-10
Short-beaked sedge (*Carex simulata*)	50	3	2-3
Baltic rush (*Juncus balticus*)	50	2	2-3
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia cespitosa*)	70	4	1-15
PERENNIAL FORBS			
American bistort (*Polygonum bistortoides*)	80	5	2-15
Sticky tofieldia (*Tofieldia glutinosa*)	70	4	1-15
Elephant's head (*Pedicularis groenlandica*)	70	3	1-15
White bog-orchid (*Habenaria dilitata*)	70	2	1-5
Jeffrey's shooting star (*Dodecatheon jeffreyi*)	60	2	1-4
Ladies tresses (*Spiranthes romanzoffiana*)	60	2	1-5

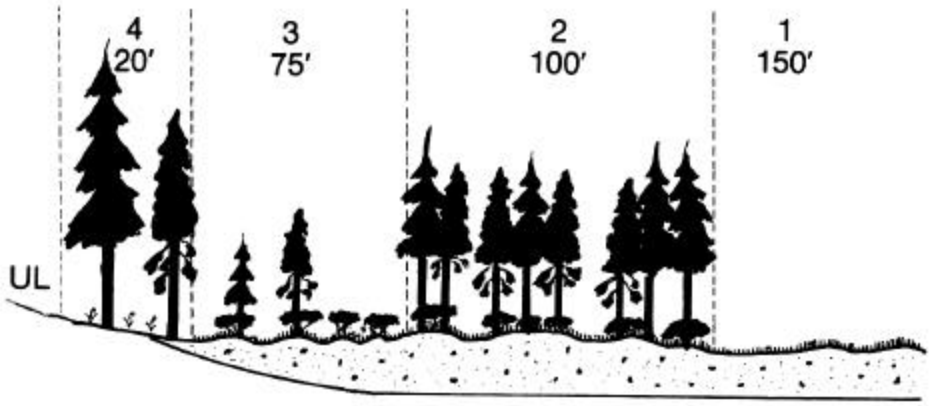
Adjacent Vegetation
Upland vegetation adjacent to this association are lodgepole pine communities.

Successional Dynamics
Long periods of drought may dry surfaces of peat soils, starting a trend where decomposition exceeds buildup. In the long run, however, fen communities are self perpetuating. The long term climax is probably a larger, deeper fen and not forestland.

Other Studies Documenting Association with Plot Data
Oregon: Kovalchik 1987

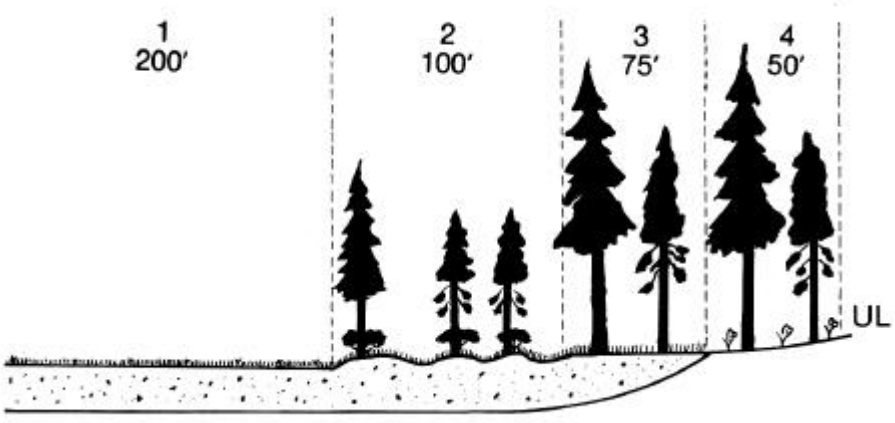
Illustrations

1 **Few-flowered spikerush**, bog
2 **Lodgepole pine/few-flowered spikerush**, bog
3 **Bog blueberry/few-flowered spikerush**, bog
4 Engelmann spruce/queencup beadlily, transition slope



Cascade Lakes Highway Bog (near Wire Meadow); low gradient, mod-high elevation basin; Deschutes Cascades Physiographic Area.

1 **Few-flowered spikerush**, bog
2 **Bog blueberry/few-flowered spikerush**, bog
3 **Engelmann spruce/widefruit sedge**, forested wetland
4 Engelmann spruce/queencup beadlily, transition slope



Upper Deschutes River Bog (nearLittle Lava Lake); low gradient, mod-high elevation basin; Deschutes Cascades PhysiographicArea.

Vaccinium uliginosum/Carex aquatilis var. dives Association

Bog blueberry/Sitka sedge Association
6 plots. CEGL001249

Ecoregional Range
EC

Environment and Soils
The bog blueberry/Sitka sedge association is common throughout the Deschutes Cascades and Winema Cascades Physiographic Areas but is absent eastward. Landforms occur in moderately high elevation, low gradient, headwater basins with cold, poorly drained soils and moderately short growing seasons. Sample plots were located at Sevenmile Marsh on the Winema National Forest and Santiam Pass, Little Cultus Marsh, Upper Big Marsh, and near Elk Lake on the Deschutes National Forest. Microtopography is slightly undulating.

Soils are wet, cold, deep, organics composed of sedge and woody peats. Soils are saturated season long, and the available water holding capacity is very high. Water tables are at or slightly above the soil surface through much of the growing season and are still within 0.5 m of the soil surface in September. Bog blueberry/Sitka sedge sites are intermediate in soil moisture relationships between the Willow/Sitka sedge and Bog blueberry/Few-flowered spikerush associations.

Valley Environment	Average	Range
Elevation (ft)	5052	4600-5500
Plot Slope (%)	1	0-3
Valley Gradient (%)	2	1-3
Soil Surface Cover (%)		
Bare Ground	20	0-50
Cryptogam	20	5-70
Litter	60	30-90

Vegetation Composition
Bog blueberry/Sitka sedge is dominated by short shrubs (less than one meter tall) and a sward of Sitka sedge. Bog blueberry and the dwarf form of Eastwood willow are the dominant shrubs. Dwarf forms of Booth and undergreen willows are often present and their physiology is very similar to Eastwood willow. Two sample stands had significant cover of bog birch, again in a dwarf form. Grasses and forbs are very inconspicuous. Bog blueberry/Sitka sedge is distinguished from bog blueberry/few-flowered spikerush by the sward of Sitka sedge and the general absence of poor fen species such as hooded ladies-tresses, few-flowered spikerush, sundew, bog saxifrage, and one-flowered gentian. It also has a low cover of mosses compared to the bog blueberry/few-flowered spikerush association. Dwarfed Engelmann spruce and lodgepole pine may be scattered through the stand on hummocks but are not representative of the site as a whole.

Adjacent Vegetation
Upland vegetation found adjacent to this association are lodgepole pine and Mountain hemlock associations.

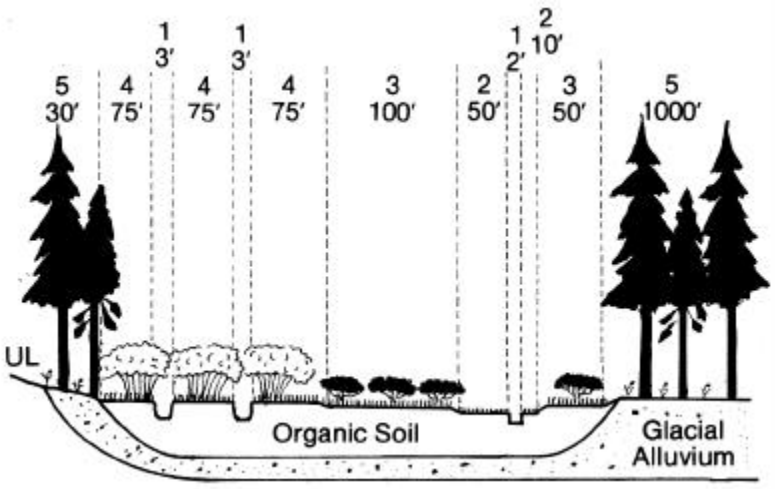
Successional Dynamics
Lower elevation sites with abundant short, young Geyer and Lemmon willows may be successional to the Geyer willow-Lemmon willow/Sitka sedge association.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE UNDERSTORY			
Lodgepole pine (*Pinus contorta*)	50	1	1-2
SHRUBS			
Bog blueberry (*Vaccinium occidentale*)	100	50	20-70
Bog birch (*Betula nana*)	50	11	3-25
Douglas' spiraea (*Spiraea douglasii*)	50	7	1-15
SEDGES and RUSHES			
Sitka sedge (*Carex aquatilis* var. *dives*)	100	39	30-63
Soft-leaved sedge (*Carex disperma*)	50	2	1-5
PERENNIAL FORBS			
American bistort (*Polygonum bistortoides*)	50	3	1-7

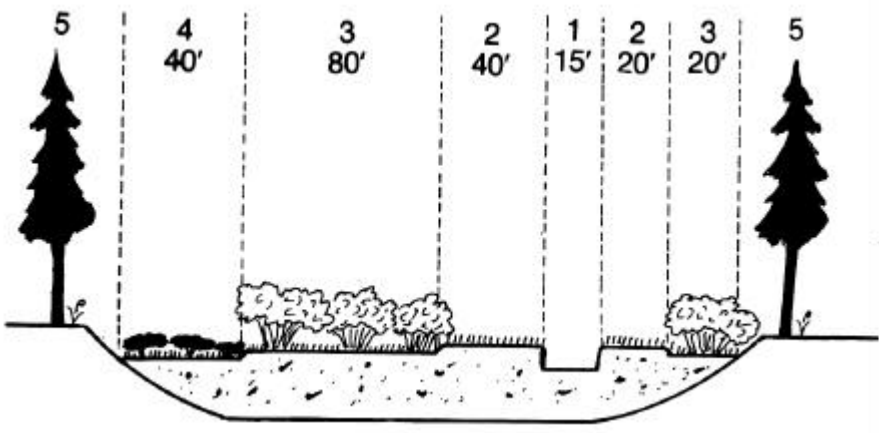
Other Studies Documenting Association with Plot Data
Oregon: Kovalchik 1987; Murray 2000

Illustrations

1 Little Cultus Creek, first order
2 **Few-flowered spikerush**, bog
3 **Bog blueberry/Sitka sedge**, bog
4 **Geyer's willow-Lemmon Willow/Sitka sedge**, wet shrub meadow
5 Engelmann spruce/queencup beadlily, terrace and toe slope



Little Cultus Marsh; low gradient,mod elevation, lake basin; Deschutes CascadesPhysiographic Area.



1 Big Marsh Creek, second order
2 **Widefruit sedge**, dike
3 **Booth willow-Geyer's willow/ widefruit sedge**, active floodplain
4 **Bog blueberry/Sitka sedge**, cutoff/overflow channel
5 Engelmann spruce/queencup beadlily, terrace

Big Marsh Creek; low gradient, mod elevation floodplain; Deschutes Cascades Physiographic Area.

*Kalmia microphylla/Carex nigricans Association**

Alpine laurel/Black alpine sedge Association
4 plots. CEGL001402.

Valley Environment	Average	Range
Elevation (ft)	7548	7140-8100
Plot Slope (%)	2	1-6
Valley Width (m)	43	20-65
Valley Gradient (%)	2	--
Valley Sideslopes (%)	30	15-45
Soil Characteristics		
Depth to Wet Soil (cm)	17	13-20
Depth to Redoximorphic Features (cm)	10	6-13
Rooting Depth (cm)	18	15-20
Soil Surface Cover (%)		
Bare Ground	2	1-3
Gravel	tr	0-1
Rock	3	0-10
Moss	28	5-65
Lichen	1	0-3
Litter	61	28-75

Ecoregional Range
BM, EC

Environment and Soils
This association is found in U- and trough-shaped valleys at high elevations in narrow to moderately wide, moderate gradient valleys. Where streams are adjacent to sample sites, they are Rosgen E4 types. Soils are mineral and fine-textured and occasionally have thin surface layers of peat (fibric histosols). Soils are not saturated but remain wet in the lower rooting zone late into the growing season.

Vegetation Composition
Alpine laurel is scattered to moderately abundant on sites other low shrubs such as dwarf huckleberry and red mountain-heath. This low shrub layer averages 20-30 cm in height. Black alpine sedge and a variety of forbs and graminoids comprise the herbaceous understory, which averages 7-10 cm in height. Moister sites have more abundant moss cover on the soil surface.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Alpine laurel (*Kalmia microphylla*)	100	35	15-50
Red mountain-heath (*Phyllodoce empetriformis*)	75	12	2-20
Dwarf huckleberry (*Vaccinium caespitosum*)	50	23	15-30
Western wintergreen (*Gaultheria humifusa*)	50	20	--
SEDGES and RUSHES			
Black alpine sedge (*Carex nigricans*)	100	25	5-50
Holm's sedge (*Carex scopulorum*)	100	12	1-15
Drummond's rush (*Juncus drummondii*)	50	3	1-5
Few-flowered spikerush (*Eleocharis quinqueflora)*	50	2	--
PERENNIAL GRASSES			
Timber oatgrass (*Danthonia intermedia*)	100	1	1-3
Alpine bentgrass (*Agrostis humilis*)	75	2	2-5
Tufted hairgrass (*Deschampsia cespitosa*)	75	3	1-3
PERENNIAL FORBS			
Idaho licoriceroot (*Ligusticum tenuifolium*)	100	6	1-15
High mountain cinquefoil (*Potentilla flabellifolia*)	100	4	1-10
Alpine meadow butterweed (*Senecio cymbalarioides*)	100	3	1-5
Subalpine daisy (*Erigeron peregrinus* ssp. *callianthemus*)	100	1	1-2
Explorer's gentian (*Gentiana calycosa*)	75	7	1-15

Adjacent Vegetation
Adjacent upland types are subalpine fir /Labrador tea-grouse huckleberry and other subalpine fir associations.

Other Studies Documenting Association with Plot Data
Washington: Kovalchik (2001) described a Merten moss-heather (*Cassiope mertensiana*)-Red mountain-heath (*Phyllodoce empetriformis*) Association that is similar to the Alpine laurel/Black alpine sedge Association.

Phyllodoce empetriformis / Juncus drummondii Association

Red mountain-heath/Drummond's rush Association
13 plots. CEGL001404

This description is taken directly from Kovalchik's (1987) Red mountain-heath Association. Only the name has been slightly changed to reflect the herbaceous understory indicator, Drummond's rush.

Ecoregional Range
BM, EC

Environment and Soils

The red mountain-heath association is abundant in subalpine and alpine settings in the East Cascade Mountains at elevations ranging from 5700 to more than 7000 feet. Sample plots were located in the Three Sisters and Mount Jefferson Wilderness Areas (Deschutes National Forest) and in Wallowa Mountains. It has also been seen at high elevations throughout the Wallowas, and in the Elkhorn, and Strawberry Mountains. The association is probably found at other locations in the Cascade Mountains such as Crater Lake National Park, Mount Thielson (Winema National Forest), and Mount Washington (Deschutes National Forest). Sites are well-drained streambanks and floodplains or moderate to steeply-sloping, moist, rocky sites below snowbanks and springs.

Soils are well drained alluvium. The surface soils on streambanks and floodplains are coarse textured, well-drained, and often have a high percentage of gravels and cobbles deposited by periodic floods. Meadows have finer textured, well-drained, loamy sands.

Valley Environment	Average	Range
Elevation (ft)	6410	5600-7340
Plot Slope (%)	8	1-30
Valley Gradient (%)	11	1-33
Soil Surface Cover (%)		
Bare Ground	17	0-40
Gravel	3	0-10
Rock	7	0-30
Bedrock	tr	0-5
Cryptogam	13	0-55
Litter	60	0-100

Vegetation Composition

This association is dominated by woody vegetation, especially red mountain-heath. Dwarfed mountain hemlock or shrubs such as delicious blueberry, mountain wintergreen, or moss heather are often common. Dwarfed willows such as Eastwood, undergreen, and Booth willows are often codominant with red mountain-heath. Common forbs and graminoids include black alpine sedge, Drummond's rush, alpine aster, Gray licoriceroot, and fanleaf cinquefoil.

Adjacent Vegetation

This association often occurs on drier sites adjacent to a meadow complex containing other commonly occurring subalpine association such as, Holm's sedge (*Carex scopulorum*), Black alpine sedge, and Few-flowered spikerush (*Eleocharis quinqueflora*). Upland vegation adjacent to sites sampled comprises Mountain hemlock (*Tsuga mertensiana*) and Subalpine fir (*Abies lasiocarpa*) associations.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE UNDERSTORY			
Mountain hemlock (*Tsuga mertensiana*)	77	11	1-35
SHRUBS			
Red mountain-heath (*Phyllodoce empetriformis*)	100	34	15-70
Cascade huckleberry (*Vaccinium deliciosum*)	62	15	1-50
SEDGES and RUSHES			
Drummond's rush (*Juncus drummondii*)	100	4	1-13
Black alpine sedge (*Carex nigricans*)	77	7	1-37
PERENNIAL FORBS			
Gray's licoriceroot (*Ligusticum grayi*)	85	6	1-10
Alpine aster (*Aster alpigenus*)	77	5	1-20
Partridgefoot (*Luetkea pectinata*)	54	6	1-15
High mountain cinquefoil (*Potentilla flabellifolia*)	54	4	1-15
Slender hawkweed (*Hieracium gracile*)	46	2	1-3
Newberry's knotweed (*Polygonum newberryi*)	46	2	1-4

Successional Dynamics

In the Cascades, this association has the potential for massive invasion by mountain hemlock. Several sample plots had abundant invasion by mountain hemlock in the past 50 years. Usually the trees are dwarfed, less than 10 feet tall, and 20-50 yearsold. It appears that mountain hemlock requires a fresh deposition of coarse alluvium as a seedbed which must be timed with successful seed producing years followed by summers of above normal precipitation and temperature (Henderson 1973). Franklin and others (1971) suggest that warmer and drier climatic trends in the past 100 years could be responsible for the invasion.

Due to the dynamic nature of this association, it is difficult to speculate on its ecological status. Periodic high runoff inundates stream-banks, the upper ends of meadows, and floodplains with deposits of coarse alluvium, creating sites for red mountainheath. In the absence of high runoff, soil surfaces gradually become dominated by fine sediments and the site changes towards black alpine sedge or Holm's sedge associations.

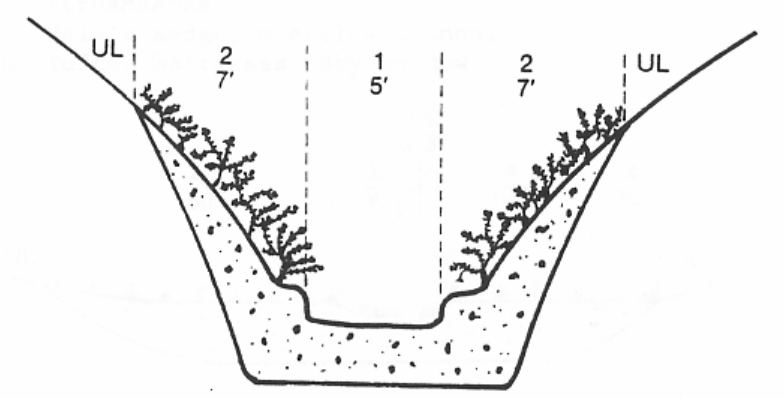
Other Studies Documenting Association with Plot Data

Oregon: Kovalchik 1987: 134

Washington: Kovalchik (2001) describes a Red mountain-heath (*Phyllodoce empetriformis*)/Cascade huckleberry (*Vaccinium deliciosum*) Association that appears to be a more mesic phase of this association.

Illustrations

1 Crater Creek, first-order
2 **Red mountainheath**, streambank



Crater Creek; steep gradient,alpine, V-shaped valley; Deschutes CascadesPhysiographic Area.

*Ledum glandulosum/Carex scopulorum Association**

Labrador tea/Holm's sedge Association
2 plots. New type

Valley Environment	Average	Range
Elevation (ft)	7095	6820-7370
Plot Slope (%)	2	1-3
Soil Characteristics		
Depth to Wet Soil (cm)	0	--
Soil Surface Cover (%)		
Bare Ground	2	1-3
Rock	3	0-5
Cryptogam	51	12-90
Litter	33	5-60

Ecoregional Range
BM

Environment and Soils
This association occurs on floodplains and adjacent to lakes in narrow, moderately steep trough-shaped valleys with gentle sideslopes. Sites are flatter, slightly hummocky landforms within these steeper valleys. Adjacent to one sample site is a Rosgen E5 stream type. Soils are peats (fibric histosols)

Vegetation Composition
Labrador tea is the dominant shrub in this association, averaging 48 cm in height. Alpine laurel and red mountain-heath are occasionally abundant. Shrub cover is denser on hummocks, while Holm's sedge and bluejoint reedgrass, averaging 26 cm in height, are the dominant herbaceous species in swales.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Labrador tea (*Ledum glandulosum*)	100	34	20-48
Alpine laurel (*Kalmia microphylla*)	50	25	--
Red mountain-heath (*Phyllodoce empetriformis*)	50	22	--
SEDGES and RUSHES			
Holm's sedge (*Carex scopulorum*)	100	20	15-25
Few-flowered spikerush (*Eleocharis quinqueflora)*	100	8	5-10
Early sedge (*Carex praeceptorum*)	50	10	--
PERENNIAL GRASSES			
Bluejoint reedgrass (*Calamagrostis canadensis*)	100	33	15-50
PERENNIAL FORBS			
High mountain cinquefoil (*Potentilla flabellifolia*)	100	7	3-10
Swamp onion (*Allium validum*)	50	30	--
Explorer's gentian (*Gentiana calycosa*)	50	5	--
Alpine meadow butterweed (*Senecio cymbalarioides*)	50	5	--

Adjacent Vegetation
Terrace and sideslope vegetation adjacent to sites sampled comprised the Subalpine fir (*Abies lasiocarpa*)/ Labrador tea (*Ledum glandulosum*)-grouse huckleberry (*Vaccinium scopulorum*) subalpine fir/grouse huckleberry associations.

Successional Dynamics
This association is unlikely to succeed to another plant association under stable environmental conditions.

Other Studies Documenting Association with Plot Data
Washington: Kovalchik (2001) describes a Red mountain-heath (*Phyllodoce empetriformis*)/Cascade huckleberry (*Vaccinium deliciosum*) Association that may include plots similar to Labrador tea/Holm's sedge plots with the addition of Cascade huckleberry.

The Francis Lake Cirque Basin Suite:

General Description:
The five shrub communities described below were sampled at two locations in the Francis Lake cirque basin in the northern Wallowa Mountains. The Farr's willow (*Salix farriae*) and Bog birch (*Betula nana*)-Shrubby cinquefoil (*Dasiphora floribunda*) communities were sampled adjacent to Francis Lake itself. The Arctic willow (*Salix arctica*) communities were sampled in a beautiful meadow complex of variously aged floodplains, oxbows and older alluvial bars created by a highly sinuous, widely meandering stream Rosgen C5 stream that is fed by snowpack and winds through the upper cirque basin above the lake.

Adjacent Vegetation:
Sideslopes of this cirque basin are vegetated by herbaceous communities and subalpine fir associations.

*Salix arctica/Carex subnigricans Community**

Arctic willow/Nearly black sedge Community
1 plot. New type

Environment and Soils:
One plot was sampled at 7730 ft. elevation on a site with 1% slope. This site was a flat terrace or high floodplain in the upper cirque basin. The soil was mineral with a 20 cm thick organic layer (hemic and fibric material) on the surface over alluvial depositional layers of sandy loam and loamy sand. Redoximorphic features are found at 25 cm depth and the water table was at 35 cm depth at the time of sampling.

Soil Surface Cover (%)	Average
Submerged	2
Moss	80
Litter	18

Vegetation Composition:
Arctic willow, a prostrate and extremely dwarfed species, averages 2 cm in height and carpets the site. Nearly black sedge (averaging 5 cm in height) and Holm's sedges are evenly dispersed across the site.

Dominant Species	Canopy Cover (%)
SHRUBS	
Arctic willow (*Salix arctica*)	95
Blueberry willow (*Salix myrtillifolia*)	1
PERENNIAL GRASSES	
Tufted hairgrass (*Deschampsia cespitosa*)	1
Alpine aster (*Aster alpigenus*)	1
SEDGES and RUSHES	
Nearly black sedge (*Carex subnigricans*)	50
Holm's sedge (*Carex scopulorum*)	30
PERENNIAL FORBS	
Elephant's head (*Pedicularis groenlandica*)	7
Alpine meadow butterweed (*Senecio cymbalarioides*)	1

Other Studies Documenting Association
none

*Salix arctica-Salix myrtillifolia/Eleocharis pauciflora Community**

Arctic willow-Blueberry willow/Few-flowered spikerush Community
1 plot. New type

Soil Surface Cover (%)	Average
Bare Ground	1
Moss	99

Environment and Soils:

One plot was sampled at 7730 ft. elevation on a site with 1% slope. This site was a flat floodplain in the upper cirque basin. The soil is mineral with 17 cm thick surface organic layer (fibric) over alluvial depositional layers of sandy loam and loamy sand. The depth to redoximorphic features is 17 cm and the water table was at 20 cm depth at the time of sampling.

Vegetation Composition:

Arctic willow averages 3 cm in height and is codominant with blueberry willow, which averages 40 cm in height. Few-flowered spikerush (averaging 12 cm in height) dominants the herbaceous layer, which is underlain by a carpet of moss.

Dominant Species	Canopy Cover (%)
SHRUBS	
Arctic willow (*Salix arctica*)	30
Blueberry willow (*Salix myrtillifolia*)	35
Farr's willow (*Salix farriae*)	3
SEDGES and RUSHES	
Few-flowered spikerush (*Eleocharis quinqueflora)*	90
Holm's sedge (*Carex scopulorum*)	5
Nearly black sedge (*Carex subnigricans*)	1
Early sedge (*Carex praeceptorum*)	1
PERENNIAL FORBS	
Elephant's head (*Pedicularis groenlandica*)	1

Other Studies Documenting Association

none

*Salix farriae/Carex aquatilis Community**

Farr's willow/Aquatic sedge Community
1 plot. New type.

Environment and Soils:

One plot was sampled at 7700 ft. elevation in a slightly concave wet meadow with 1% slope. The soil is mineral with 86 cm of alternating layers of silt loam, sand and loamy sand over a gravel bed. The depth to redoximorphic features is 17 cm, and the water table was at 20 cm depth at the time of sampling.

Soil Surface Cover (%)	Average
Submerged	2
Bare Ground	10
Moss	85
Litter	5

Vegetation Composition:

Farr's willow (averaging 50 cm in height) dominates the shrub layer over a sward of aquatic sedge, which averages 25 cm in height.

Dominant Species	Canopy Cover (%)
SHRUBS	
Farr's willow (*Salix farriae*)	60
Booth willow (*Salix boothii*)	6
SEDGES and RUSHES	
Aquatic sedge (*Carex aquatilis*)	75
Few-flowered spikerush (*Eleocharis quinqueflora)*	3
Holm's sedge (*Carex scopulorum*)	1
PERENNIAL GRASSES	
Tufted hairgrass (*Deschampsia cespitosa*)	1
PERENNIAL FORBS	
Alpine meadow butterweed (*Senecio cymbalarioides*)	3
Sticky polemonium (*Polemonium viscosum*)	1
Western aster (*Aster occidentalis*)	1
Idaho licoriceroot (*Ligusticum tenuifolium*)	1
Alpine shooting star (*Dodecatheon alpinum*)	1
Yarrow (*Achillea millefolium*)	1
FERNS and HORSETAILS	
Variegated scouringrush (*Equisetum variegatum*)	2

Other Studies Documenting Association

Kovalchik (2001) describes a *Salix farriae*/*Carex utriculata* Association in which *Salix farriae/Carex aquatilis* communities are included.

*Salix farriae/Allium validum-Carex scopulorum Community**

Farr's willow/Swamp onion-Holm's sedge Community
1 plot. New type

Vegetation Composition:
Farr's willow (averaging 46 cm in height) and Booth willow (averaging 80 cm in height) dominate the shrub layer over a sward of swamp onion, Holm's sedge and tufted hairgrass. Herbaceous vegetation averages 36 cm in height.

Other Studies Documenting Association
Kovalchik (2001) describes a *Salix farriae/Carex scopulorum* Association in which this community would be included.

Dominant Species	Canopy Cover (%)
SHRUBS	
Farr's willow (*Salix farriae*)	60
Booth willow (*Salix boothii*)	18
SEDGES and RUSHES	
Holm's sedge (*Carex scopulorum*)	15
Rock sedge (*Carex saxatilis*)	1
PERENNIAL GRASSES	
Tufted hairgrass (*Deschampsia cespitosa*)	15
PERENNIAL FORBS	
Swamp onion (*Allium validum*)	80
Alpine meadow butterweed (*Senecio cymbalarioides*)	20
Howell's marsh marigold (*Caltha leptosepala* spp. *howellii*)	10
Rocky Mountain grass of Parnassus (*Parnassia fimbriata*)	1
Sticky polemonium (*Polemonium viscosum*)	1
High mountain cinquefoil (*Potentilla flabellifolia*)	1
Meadow arnica (*Arnica chamissonis*)	1

*Betula nana-Dasiphora floribunda /Kobresia simpliciusula-Thalictrum alpinum Community**

Bog birch-shrubby cinquefoil/Simple bog sedge-alpine-alpine meadowrue Community
1 plot. New type

Soil Surface Cover (%)	Average
Bare Ground	30
Cryptogam	5
Litter	65

Environment and Soils
This community was sampled at 7710 ft. elevation on a moist meadow surface above Francis Lake. The site has a 9% slope and slightly undulating microrelief. The soil was mineral with 25 cm of loam over a deep fine sandy loam. Water table was at 97 cm, but wet soil was reached at 37 cm and redoximorphic features are at 25 cm. Soil was mineral.

Vegetation Composition
Bog birch (averaging 62 cm in height) and shrubby cinquefoil (averaging 25 cm in height) are co-dominant in the shrub layer over a mix of herbaceous species, averaging 5 cm in height.

Other Studies Documenting Association
none

Dominant Species	Canopy Cover (%)
SHRUBS	
Bog birch (*Betula nana*)	55
Shrubby cinquefoil (*Potentilla fruticosa*)	80
SEDGES and RUSHES	
Simple bog sedge (*Kobresia simpliciuscula*)	20
Nearly black sedge (*Carex subnigricans*)	10
PERENNIAL GRASSES	
Timber oatgrass (*Danthonia intermedia*)	5
Slender muhly (*Muhlenbergia filiformis*)	3
Tufted hairgrass (*Deschampsia cespitosa*)	2
Bearded wheatgrass (*Agropyron caninum*)	1
PERENNIAL FORBS	
Alpine meadowrue (*Thalictrum alpinum*)	30
Alpine meadow butterweed (*Senecio cymbalarioides*)	20
Elkweed (*Frasera speciosa*)	1

SHRUB – WILLOW ASSOCIATIONS

The willow associations are organized in three major groups.

WILLOW MEADOW / FLOODPLAIN TYPES
WILLOW GRAVEL BAR TYPES
WARM WILLOW TYPES

Salix geyeriana/Calamagrostis canadensis Association

Geyer's willow/Bluejoint reedgrass Association
1 plot. CEGL001205

Ecoregional Range
BM, EC?

Environment and Soils
One site was sampled at 5400 ft. elevation with a 2% slopes. The depth to redoximorphic features in the soil profile is 5 cm and the water table depth at the time of sampling was 41 cm. The ground surface had 100% litter cover.

Vegetation Composition
Geyer willow averages 2.5 m in height. Herbaceous layer averages 31 cm in height. Herbaceous biomass is 533 lbs/acre.

Dominant Species	Canopy Cover (%)
SHRUBS	
Geyer's willow (*Salix geyeriana*)	70
SEDGES and RUSHES	
Aquatic sedge (*Carex aquatilis* var. *aquatilis*)	7
Bladder sedge (*Carex utriculata*)	2
PERENNIAL GRASSES	
Bluejoint reedgrass (*Calamagrostis canadensis*)	80
Tufted hairgrass (*Deschampsia cespitosa*)	2
PERENNIAL FORBS	
Bigleaf lupine (*Lupinus polyphyllus*)	15
Great North aster (*Aster modestus*)	4
Elephant's head (*Pedicularis groenlandica*)	3
Western buttercup (*Ranunculus occidentalis*)	2

Adjacent Vegetation
Upland vegetation types on sideslopes adjacent to this site are Subalpine fir-Engelmann spruce communities.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997.
Eastern Idaho-western Wyoming: Youngblood and others 1985.
Utah and southeastern Idaho: Padgett and others 1989

Salix boothii-Salix geyeriana/Carex utriculata Association

Booth willow-Geyer's willow/Bladder sedge Association
16 plots. CEGL001178

Ecoregional Range
BM, BR, EC

Environment and Soils

The Booth willow-Geyer willow/Bladder sedge Association occurs in the Blue Mountains, Basin and Range and East Cascades Ecoregions. Valleys are moderate to wide (200-1000 ft.), low gradient and flat-shaped with gentle to moderately steep side slopes. Elevations range from 4350 to 5540 ft. Fluvial geomorphic surfaces are flat to slightly undulating or concave floodplains, wet basins and springs. It is the wettest of the willow/sedge associations and is usually found where beaver dams, check dams, road crossings, or simply poor drainage floods willow sites. Soils are Endoaquolls, Endoaquents, Borohemists, and Borosaprists. The soils consist of fine-textured (silt loam, loam, sandy loam) mineral material or deep hemic or sapric organic matter. One site had gravelly, sandy soil. In organic soils the organic layer often extends to a depth of 1 to 2 or more meters, indicating a very long period (thousands of years) of stability on the site. Available water holding capacity is generally high, and sites are often flooded well into the summer. By late summer the water table has usually dropped to within 30-60 cm of the soil surface. The surface soils remain moist through the growing season except in driest years. The willows in this association can withstand de-oxygenated conditions in their rooting zones, but prolonged flooding of the root crowns can kill them. Stream reach types associated with sites sampled are low gradient, highly sinuous C5, C6, E4, E5, and E6.

Valley Environment	Average	Range
Elevation (ft)	4944	4080-5800
Plot Slope (%)	4	0.5-40
Valley Width (m)	175	65-350
Valley Gradient (%)	5	1-40
Valley Sideslopes (%)	30	15-70
Soil Surface Cover (%)		
Submerged	27	0-90
Bare Ground	13	0-70
Gravel	tr	0-1
Rock	tr	0-1
Cryptogam	4	0-37
Litter	60	5-100

Vegetation Composition

Geyer willow, booth willow, lemmon willow, bebb willow, and/or (occasionally) bog birch or a combination of these species dominate the shrub overstory, which averages 5.5 m in height, ranging from 1.2-9.8 m. Whitestem gooseberry or mountain alder are occasionally present in the stand. Whitestem gooseberry is often very heavily browsed and found only under the protection of the main willow stems. The shrub understory averages 2.3 m in height, ranging from 0.6-6.2 m. Bladder sedge is the dominant graminoid, sometimes forming a near monoculture. Other sedges such as woolly (*Carex lanuginosa*) or aquatic sedge become important on drier margins of the association. Nebraska sedge (*Carex nebrascensis*) and Baltic rush increase in cover on disturbed sites. Tufted hairgrass is present on many plots but is very subordinant to sedges. Small amounts of forbs may be present, including large-leaf avens, western polemonium, field mint, hairy willow-herb, yellow monkey-flower, western dock, longstalk clover and Douglas' water hemlock. The herbaceous layer averages 55 cm in height, ranging from 20 to 91 cm. Herbaceous biomass averages 2034 lbs/acre, ranging from 1060 ro 3400 lbs/acre.

Soil Profile Characteristics	
Water Table Depth (cm)	avg: 25 (range: 0-56)
Total Rooting Depth (cm)	avg: 16 (range: 5-25)
Thickness of Organic Layer (cm) – where present	avg: 28 (range: 5-48)
Surface Layer	
Thickness (cm)	10-53
Texture(s)	sapric, hemic, fibric organic, silt loam,sandy loam
Coarse Fragments (%)	0
Roots	very fine: many fine: common to many medium: none to common coarse: none to common
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	16-81
Texture(s)	sapric, hemic organic, organic loam, silt loam, silty clay loam, loam, fine sandy loam
Coarse Fragments (%)	0-20, gravel
Roots	very fine: many fine: common to many medium: few to none coarse: none to many
Redoximorphic Features	some iron oxidation
Substrate	organics, gravel

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Geyer's willow (*Salix geyeriana*)	82	21	1-50
Booth willow (*Salix boothii*)	69	32	1-85
Bog birch (*Betula nana*)	13	65	60-70
Bebb's willow (*Salix bebbiana*)	6	30	1-30
Whitestem gooseberry (*Ribes inerme*)	25	4	1-5
Mountain alder (*Alnus incana*)	13	5	1-8
SEDGES and RUSHES			
Bladder sedge (*Carex utriculata*)	94	64	15-95
Aquatic sedge (*Carex aquatilis* var. *aquatilis*)	44	18	2-40
Small-fruit bulrush (*Scirpus microcarpus*)	38	7	tr-20
Baltic rush (*Juncus balticus*)	31	9	tr-20
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia cespitosa*)	38	3	tr-15
Kentucky bluegrass (*Poa pratensis*)	38	2	tr-5
PERENNIAL FORBS			
Large-leaf avens (*Geum macrophyllum*)	56	2	tr-5
Western polemonium (*Polemonium occidentale*)	50	5	tr-15
Field mint (*Mentha arvensis*)	31	4	1-10
Hairy willow-herb (*Epilobium ciliatum*)	31	2	tr-4
Yellow monkeyflower (*Mimulus guttatus*)	31	2	tr-3

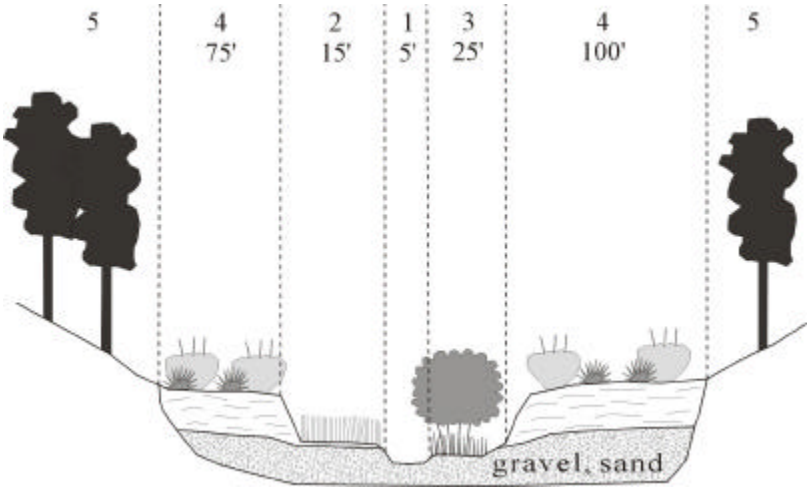
Successional Dynamics

The dense, tough sod formed by bladder and inflated sedge is very tolerant to grazing and will rapidly redominate disturbed sites with rest and late season grazing. With overuse by livestock, however, other graminoids and forbs become co-dominant with bladder sedge. Tufted hairgrass, Nebraska sedge, Baltic rush, and forbs were co-dominant with bladder sedge on two plots in mid seral ecological status.

Adjacent Vegetation
Vegetation types adjacent to sites sampled are:
terraces – Shrubby cinquefoil/Kentucky bluegrass, Ponderosa pine/Kentucky bluegrass, Mountain big sagebrush/Cusick's bluegrass and Lodgepole pine/tufted hairgrass;
sideslopes - ponderosa pine/Idaho fescue-Bluebunch wheatgrass, big sagebrush/Idaho fescue-bluebunch wheatgrass, ponderosa pine/pinegrass, and other ponderosa pine associations.

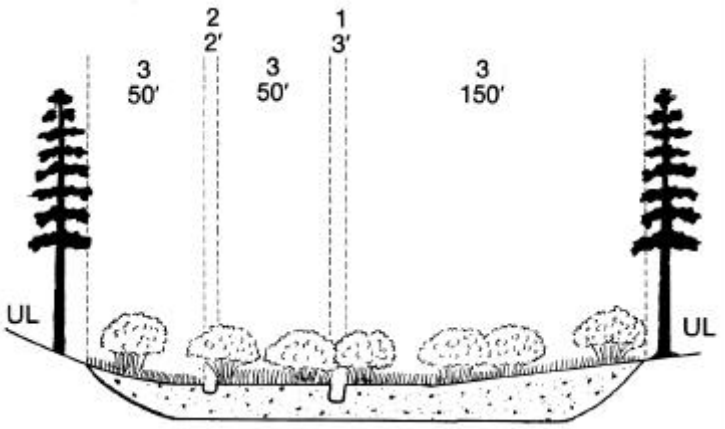
Other Studies Documenting Association with Plot Data
Oregon: Kovalchik 1987 described this association under the name *Salix/Carex rostrata*; Crowe and Clausnitzer 1997 described this association under the name *Salix/Carex utriculata.*
Washington: Kovalchik 2000 describes the *Salix Carex utriculata* Association, which is similar to this association
Nevada: Manning and Padgett 1995 described the same association as this under the name *Salix geyeriana/Carex rostrata*.

Illustrations



1 E6 stream reach
2 **Baltic rush** (**woolly sedge** potential), floodplain
3 **Booth willow-Geyer's willow/Bladder sedge**, floodplain
4 **Mountain big sagebrush/Cusick's bluegrass**, terraces
5 Ponderosa pine, northwest- and southeast-facing sideslopes

Trout Creek, Unity RD, Wallowa-Whitman NF; mod. low gradient, mod. elevation, trough-shaped valley; Continental Zone Province.



1 Allison Creek, first order
2 Overflow channel
3 **Booth willow-Geyer's willow/Bladder sedge**, streambanks, wet shrub meadow

Allison Creek Marsh; low gradient,mod-high elevation basin; Ochoco MountainsPhysiographic Area.

Salix geyeriana-Salix lemmonii/Carex aquatilis var. dives Association

Geyer willow-Lemmon willow/Sitka sedge Association
11 plots. CEGL001212

Ecoregional Range
EC

Environment and Soils
The Geyer willow-Lemmon willow/Sitka sedge association is abundant in the central East Cascades Ecoregion (on the Deschutes National Forest), and rare in the southern East Cascades Ecoregion (on the Winema and Fremont National Forests). Elevations are low to moderately high, ranging from 3100 at Indian Ford Creek to 4900 feet near Santiam Pass and 5200 feet on Big Marsh Creek (Deschutes National Forest). The association occurs on two landforms: 1) low gradient floodplains along streams in the LaPine Basin and along the Deschutes and Little Deschutes Rivers, Crescent Creek, and Indian Ford Creek and 2) the headwaters of these and tributary drainages in wet, poorly drained marshes and swamps such as Upper Big Marsh, Little Cultus Marsh, Sparks Lake Marsh, and the marsh at the head of Link Creek (near Santiam Pass). Floodplain soils are very deep alluviums that usually have surface textures of organic loams. Headwaters basin soils are deep sedge peats. Available water holding capacity is high. Water tables are near to above the soil surface well into the summer. Some of the watersheds with this association have peak water flow in late summer (August) because it takes several months for snowmelt to work through the deep pumice and basalt mantle of the Cascades.

Valley Environment	Average	Range
Elevation (ft)	4519	3160-5300
Plot Slope (%)	0.5	0-1
Valley Gradient (%)	1	--
Soil Characteristics		
Water Table Depth (cm)	33	+5-120
Thickness of Surface Organic Layer (cm)	57	40-80
Soil Surface Cover (%)		
Submerged	20	0-98
Bare Ground	11	0-50
Gravel	-	-
Rock	-	-
Cryptogam	9	0-37
Litter	61	2-95

Vegetation Composition
Geyer willow-Lemmon willow/Sitka sedge is dominated by tall willows and a sward of Sitka sedge. The closely related Geyer and Lemmon willows are dominant in the floodplain landform. In the headwaters landform Eastwood willow (sometimes with Sitka willow) may be co-dominant with Geyer and Lemmon willows. Eastwood willow or bog birch may be dominant where beaver have reduced the cover of the more palatable Geyer, Lemmon, and Sitka willow. Douglas' spiraea and bog blueberry are often common under the shrubs. Bladder sedge is common on wetter sites, but other graminoids and forbs are inconspicuous. Typical forbs include white bogorchid, water hemlock, common horsetail, pink wintergreen, and sweet-scented bedstraw.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-SUBDOMINANTS			
Lodgepole pine (*Pinus contorta*)	46	5	1-10
Engelmann spruce (*Picea engelmannii*)	27	3	1-5
TREE UNDERSTORY			
Engelmann spruce (*Picea engelmannii*)	36	2	1-3
Lodgepole pine (*Pinus contorta*)	36	2	1-2
SHRUBS			
Geyer's willow (*Salix geyeriana*)	73	32	15-60
Douglas' spiraea (*Spiraea douglasii*)	73	10	1-15
Bog birch (*Betula nana*)	55	33	15-65
Bog blueberry (*Vaccinium uliginosum*)	46	20	5-35
Lemmon willow (*Salix lemmonii*)	27	49	37-70
Eastwood willow (*Salix eastwoodiae*)	9	65	--
SEDGES and RUSHES			
Sitka sedge (*Carex aquatilis var. dives*)	91	54	25-95
Bladder sedge (*Carex utriculata*)	36	18	5-37
Small-fruit bulrush (*Scirpus microcarpus*)	27	3	tr-5
PERENNIAL GRASSES			
Bluejoint reedgrass (*Calamagrostis canadensis*)	36	3	tr-5
PERENNIAL FORBS			
Pink wintergreen (*Pyrola asarifolia*)	46	4	tr-5
Hairy willow-herb (*Epilobium ciliatum*)	36	3	tr-5
Sweet-scented bedstraw (*Galium trifolium*)	36	3	tr-5
Water hemlock (*Cicuta douglasii*)	27	1	tr-2
White bog-orchid (*Habenaria dilatata*)	27	tr	--
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	46	5	tr-15

Successional Dynamics

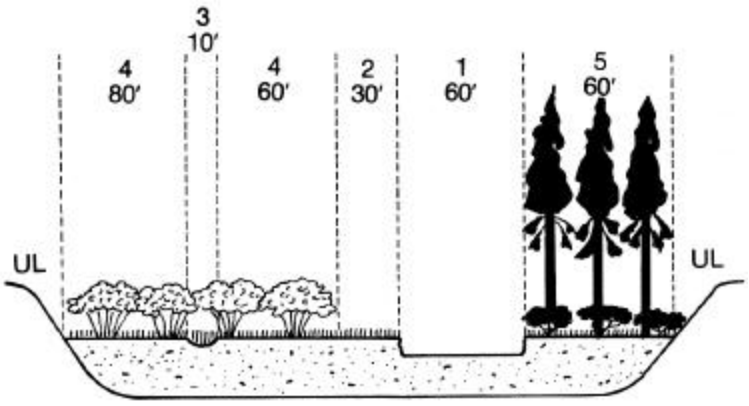
With overuse by livestock, grasses and forbs become more prevalent in the stand. This association has not been observed in less than late seral ecological status and Sitka sedge will rapidly recolonize the site with rest and late seasongrazing.

Other Studies Documenting Association with Plot Data

Oregon: Kovalchik 1987 described this association under the name Salix/Carex sitchensis

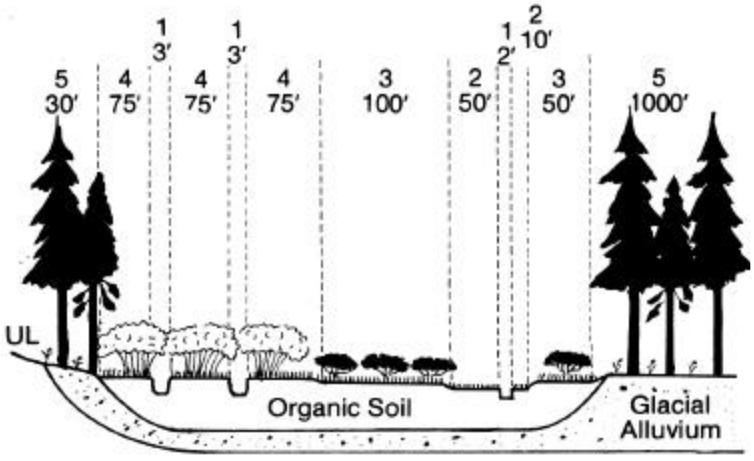
Illustrations

1 Deschutes River, fifth order
2 **Sitka sedge**, active floodplain
3 **Beaked sedge**, overflow channel, active channel shelves
4 **Geyer willow-Lemmon willow/Sitka sedge**, active floodplain
5 **Lodgepole pine/Douglas spiraea/widefruit sedge**, inactive floodplain



Deschutes River; low gradient,mod-low elevation floodplain; LaPine BasinPhysiographic Area; Deschutes National Forest.

1 Little Cultus Creek, first order
2 **Few-flowered spikerush**, bog
3 **Bog blueberry/Sitka sedge**, bog
4 **Geyer willow-Lemmon willow/Sitka sedge**, wet shrub meadow
5 Engelmann spruce/queencup beadlily, terrace and toe slope



Little Cultus Marsh; low gradient,mod elevation lake basin; Deschutes CascadesPhysiographic Area.

Salix boothii-Salix geyeriana/Carex aquatilis var. aquatilis Association

Booth willow-Geyer's willow/Aquatic sedge Association
15 plots. CEGL001184

Ecoregional Range
BM, EC

Environment and Soils

The willow/aquatic sedge association occurs at moderate to high elevations and is abundant in the southern East Cascades Ecoregion (especially on Fremont National Forest). It is also common in the Blue Mountains Ecoregion and was probably more common 200 years ago but is largely degraded to the Kentucky bluegrass communities by overgrazing and erosion. Valleys are moderate to wide, low gradient and flat-shaped with gentle side slopes. The association is common on two landforms: 1) low gradient basins in the headwaters of drainages and 2) narrow, low to moderate gradient floodplains in the upper elevational reaches of streams. It also occurs occasionally in springs. Soils are slightly drier than the aquatic sedge association. It thrives on the deep, fine-textured soils that build up behind beaver dams. Surface textures are silt loam, organic-rich silt or fine sandy to clay loams. Soils are Endoaquolls and Endoaquents. Available water holding capacity is moderate to high. The soil surface is flooded in May and June, and can lower to 2 m of the soil surface by September but generally remains within 50-75 cm of the soil surface thoughout the year.

Valley Environment	Average	Range
Elevation (ft)	5399	4690-6300
Plot Slope (%)	2	tr-5
Valley Width (m)	168	20-350
Valley Gradient (%)	3	1-5
Valley Sideslopes (%)	28	15-70
Soil Characteristics		
Current Water Table Depth (cm)	42	0-71
Rooting Depth (cm)	44	20-76
Depth to Redoximorphic Features (cm)	23	8-51
Depth to Wet Soil (cm)	7	0-20
Soil Surface Cover (%)		
Submerged	15	0-80
Bare Ground	4	0-20
Gravel	tr	0-5
Rock	1	0-20
Cryptogam	12	0-37
Litter	74	20-100

The willows in this association can withstand de-oxygenated conditions in their rooting zones, but prolonged flooding of the root crowns can kill them. Rosgen stream reach types associated with sites sampled are low gradient, highly sinuous C4, C5, E4, E5, and E6 and in degraded areas, F6.

Vegetation Composition

Booth, Geyer, and Lemmon willows (and/or occasionally bog birch) - either singly or in combination- dominate the shrub overstory, averaging 3.4 m in height (ranging from 0.9 to 13.5 m). Whitestem gooseberry, Drummond's willow, or mountain alder are occasionally present in the stand. When present, the scattered shrub understory is dominated by various currant species averaging 1 m in height. Aquatic sedge is the dominant graminoid, generally excluding extensive cover by forbs. Other graminoids include bluejoint reedgrass, tufted hairgrass, alpine timothy, Kentucky bluegrass, bladder sedge and Baltic rush. The rich forb component includes mesic species such as western polemonium, large-leaved avens, Oregon checkermallow, hairy willow-herb, American bistort and elephant's head. The herbaceous layer averages 47cm in height, ranging from 31-91cm. Herbaceous biomass averages 1810 lbs/acre, ranging from 938-3223 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Booth willow (*Salix boothii*)	53	22	5-40
Geyer's willow (*Salix geyeriana*)	53	16	1-50
Bog birch (*Betula nana*)	33	24	3-70
SEDGES and RUSHES			
Aquatic sedge (*Carex aquatilis* var. *aquatilis*)	100	49	5-100
Baltic rush (*Juncus balticus*)	60	11	1-50
Bladder sedge (*Carex utriculata*)	33	7	2-10
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia cespitosa*)	40	7	1-30
Kentucky bluegrass (*Poa pratensis*)	40	5	tr-20
Bluejoint reedgrass (*Calamagrostis canadensis*)	33	9	tr-40
Alpine timothy (*Phleum alpinum*)	33	2	tr-5
PERENNIAL FORBS			
Western polemonium (*Polemonium occidentale*)	73	4	tr-5
Large-leaf avens (*Geum macrophyllum*)	67	3	tr-15
Oregon checkermallow (*Sidalcea oregana*)	53	3	tr-15
Dandelion (*Taraxacum officinale*)	53	1	tr-5
Yarrow (*Achillea millefolium*)	53	1	tr-2
Hairy willow-herb (*Epilobium ciliatum*)	47	2	tr-5
Starry false Solomon's seal (*Smilacina stellata*)	40	4	tr-10
American bistort (*Polygonum bistortoides*)	33	4	2-10
Elephant's head (*Pedicularis groenlandica*)	33	3	tr-5

Adjacent Vegetation

Vegetation types adjacent to sites sampled are: terraces – Big sagebrush, Lodgepole pine/tufted hairgrass, lodgepole pine/Kentucky bluegrass, Silver sagebrush/Cusick's bluegrass, and Ponderosa pine; sideslopes - ponderosa pine/Geyer's sedge, ponderosa pine/big sagebrush/Idaho fescue-Bluebunch wheatgrass, ponderosa pine/pinegrass and ponderosa pine/Common snowberry.

Successional Dynamics

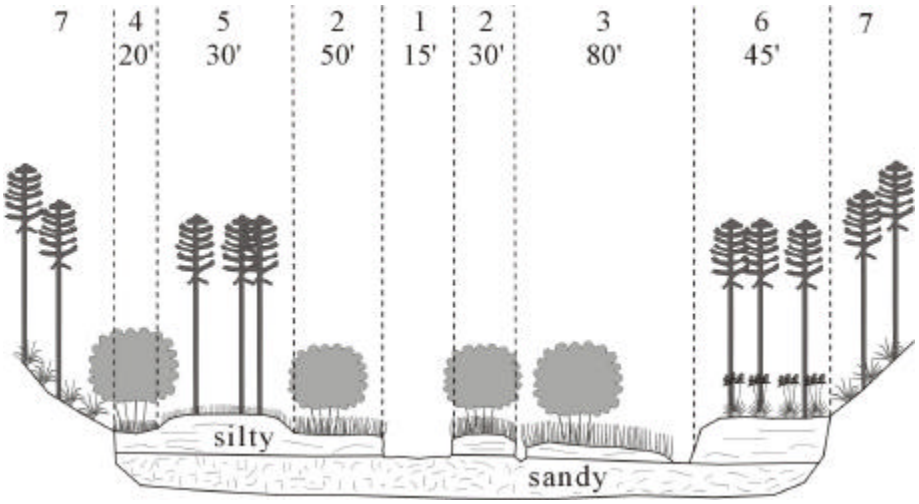
With overuse by livestock, other graminoids and forbs become codominant withaquatic sedge. There is an increase in Baltic rush and short sedges such as short-beaked, and Jones' sedges. Grasses such as tufted hairgrass, Kentucky bluegrass, and Wolf's trisetum (*Trisetum wolfii*) increase in cover. There is a strong increase in mesic forbs. Willows show some decrease in vigor as indicated by uneven stemage distribution, highlining, or dead clumps.

With continued overuse, rushes, small sedges and forbs dominate aquatic sedge. Willows show a sharp decline in vigor and cover. Streambed downcutting may lower the water table and lower the site potential to willow/Kentucky bluegrass or Kentucky bluegrass community types.

Other Studies Documenting Association with Plot Data

Oregon: Kovalchik (1987) and Crowe and Clausnitzer (1997) described this association under the name *Salix/Carex aquatilis*; Crowe and Clausnitzer
Utah and southeastern Idaho: Padgett *et al.* (1989) describe Booth willow/Aquatic sedge and Geyer willow/Aquatic sedge community types that correspond to this association
Montana: Hansen *et al.* (1995) describe a Geyer willow/Aquatic sedge habitat type that corresponds to this
Colorado: Kittel *et al.* (1999)) describe a Geyer willow/Aquatic sedge habitat type that corresponds to this association

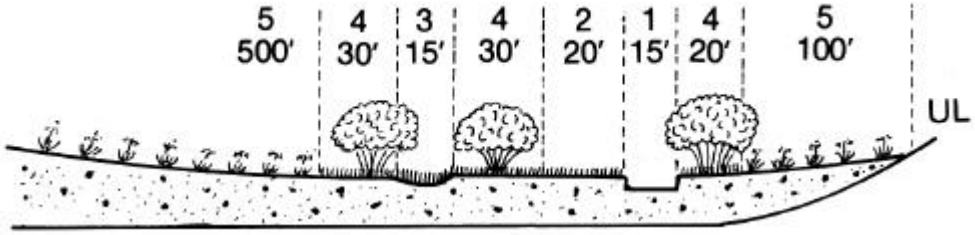
Illustrations



1 E6 stream reach
2 **Booth-Geyer's willow/aquatic sedge**, floodplain
3 **Booth-Geyer's willow/bladder sedge**, floodplain swale
4 **Booth-Geyer's willow/aquatic sedge**, overflow swale
5 Lodgepole pine/Kentucky bluegrass, terrace
6 **Lodgepole pine/tufted hairgrass**, terrace
7 Lodgepole pine/pinegrass, west-and east-facing sideslopes

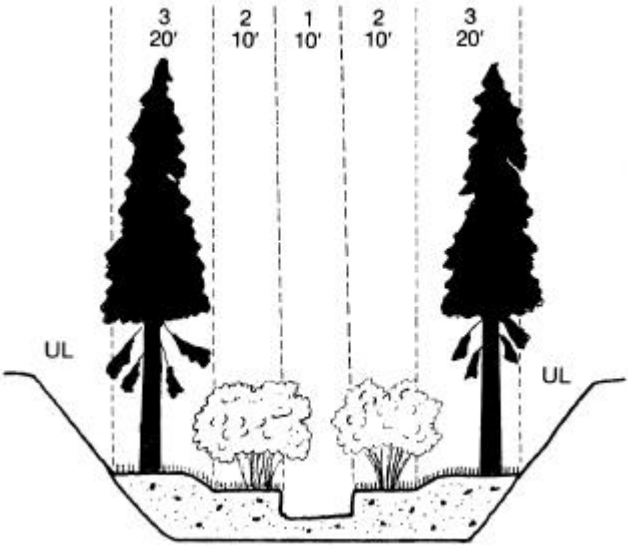
Bear Creek, Bear Valley RD, Malheur NF; very low gradient, moderate elevation, flat-shaped valley Province

1 Sycan River, third order
2 **Aquatic sedge**, streambanks and active floodplains
3 **Aquatic sedge**, overflow channels
4 **Booth willow-Geyer's willow/aquatic sedge**, active floodplains
5 **Tufted hairgrass**, moist meadows



Upper Sycan River Meadow; low gradient, mod-high elevation basin; Basin and Range Physiographic Area; Fremont NationalForest.

1 Sycan River, second order
2 **Booth willow-Geyer's willow/aquatic sedge**, streambanks and active channel shelves
3 **Lodgepole pine/aquatic sedge**, inactive floodplains



Sycan River; mod gradient, mod-high elevation floodplains; Basin and Range Physiographic Area; Fremont National Forest.

Salix boothii-Salix geyeriana/Carex angustata (C. eurycarpa) Association

Booth Willow-Geyer's Willow/Widefruit sedge Association
16 plots. CEGL001185

Ecoregional Range
EC

Environment and Soils
Willow/widefruit sedge is widespread in the mountains of the East Cascades Ecoregion Elevations are low to moderate. The association occurs on several landforms: 1) low gradient, low elevation floodplains along the Deschutes River and its tributaries in the LaPine Basin Physiographic Area, 2) shallow, pumice-filled drainages in the LaPine Basin and Pumice-mantled Basin and Range Physiographic Areas, and 3) scattered, moderate elevation basins. Soils are variable. Floodplain and swale soils are deep alluvium having surface textures of silt, fine sandy loam, or organic loam. Basin soils are composed of sedge peats or organic loam. Subsurface soils are often coarse, water-saturated pumice. Available water capacity is moderate to high, and soils remain moist through the summer in most years. Sites are flooded to 0 to 20 cm above the soil surface in the spring. The water level lowers to 30 to 70 cm below the soil surface by September.

Valley Environment	Average	Range
Elevation (ft)	4398	1300-4950
Plot Slope (%)	0.7	0-2
Valley Gradient (%)	1.1	1-2
Soil Characteristics		
Current Water Table Depth (cm)	35	10-60
Thickness of Surface Organic Layer (cm)	53	10-98
Soil Surface Cover (%)		
Submerged	6	0-98
Bare Ground	7	0-30
Gravel	-	-
Rock	-	-
Cryptogam	5	0-30
Litter	81	2-100

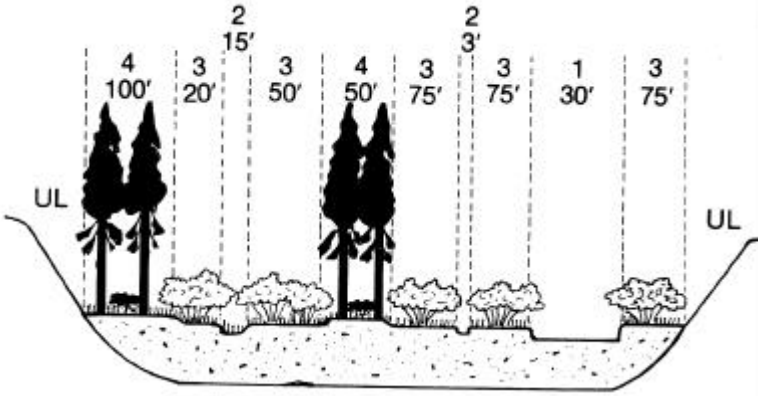
Vegetation Composition
Sites are dominated by tall Geyer, Lemmon, and/or Booth willows and widefruit sedge. One higher elevation stand (5000 feet) near MacKenzie Pass was dominated by Eastwood willow. Other willows include whiplash and yellow willow. Bog birch was common but is never dominant. Douglas spiraea and bog blueberry may be common underthe willows. Other graminoids include bluejoint reedgrass, Kentucky bluegrass, bladder sedge and Baltic rush. Forbs include sweet-scented bedstraw, meadow arnica, western St.Johns wort, large-leaved avens, western polemonium and scarlet paintbrush.

Successional Dynamics
With overuse by livestock, Kentucky bluegrass and other herbs can become codominant with widefruit sedge. Willow cover can decrease in vigor as indicated by uneven distribution, highlining, and decreasing cover.

Other Studies Documenting Association with Plot Data
Oregon: Kovalchik (1987) described this association under the name Salix/Carex eurycarpa.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-SUBDOMINANTS			
Lodgepole pine (*Pinus contorta*)	44	8	5-15
TREE UNDERSTORY			
Lodgepole pine (*Pinus contorta*)	38	3	1-7
SHRUBS			
Geyer's willow (*Salix geyeriana*)	94	22	10-40
Douglas' spiraea (*Spiraea douglasii*)	75	17	1-37
Bog birch (*Betula nana*)	63	13	1-40
Booth willow (*Salix boothii*)	50	40	15-70
Wood's rose (*Rosa woodsii*)	44	2	1-5
SEDGES and RUSHES			
Widefruit sedge (*Carex angustata*)	94	41	7-80
Bladder sedge (*Carex utriculata*)	50	11	tr-63
Baltic rush (*Juncus balticus*)	50	2	--
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	50	2	tr-5
Bluejoint reedgrass (*Calamagrostis canadensis*)	50	2	tr-5
PERENNIAL FORBS			
Sweet-scented bedstraw (*Galium trifolium*)	50	3	tr-15
Meadow arnica (*Arnica chamissonis*)	44	2	tr-4
Western St. John's wort (*Hypericum formosum*)	44	2	tr-5
Large-leaf avens (*Geum macrophyllum*)	44	2	tr-5
Western polemonium (*Polemonium occidentale*)	31	5	tr-15
Scarlet paintbrush (*Castilleja miniata*)	31	2	tr-5

Illustrations

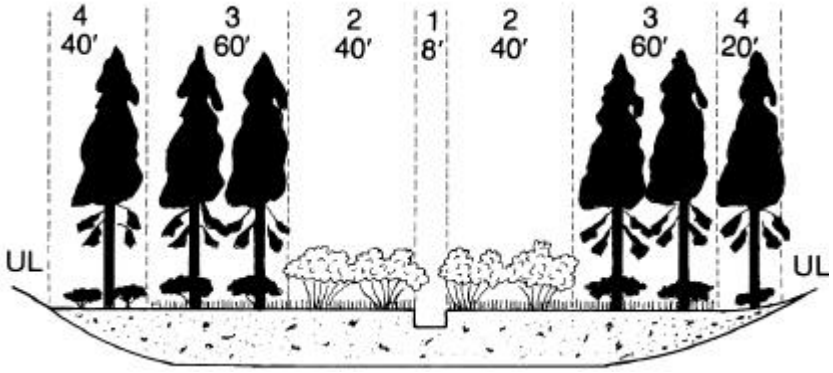


1. Crescent Creek, third order
2. **Sitka sedge** or **beaked sedge**, active channel shelves and overflow channels
3. **Booth willow-Geyer's willow/widefruit sedge**, active floodplains
4. **Lodgepole pine/bog blueberry/ widefruit sedge**, inactive floodplains

Crescent Creek; low gradient,mod-low elevation floodplains; LaPine Basin.

1 Spruce Creek, second order
2 **Booth willow-Geyer's willow/ widefruit sedge**, active floodplains
3 **Lodgepole pine/Douglas spiraea widefruit sedge**, inactive floodplain
4 **Lodgepole pine/Douglas spiraea/ forb**,transitional

Spruce Creek; low gradient,moderately low elevation floodplains; LaPine Basin



Salix boothii-Salix geyeriana/Carex pellita (C. lanuginosa) Association

Booth willow-Geyer's willow/Woolly sedge Association
19 plots. CEGL001184 = *Salix boothii – Salix geyeriana.*

Ecoregional Range
BM, BR, EC

Environment and Soils

The Booth willow-Geyer's willow/Woolly sedge Association occurs commonly at low to moderate elevations in the southern Blue Mountains and southeastern East Cascades Ecoregions as well as in the Basin and Range Ecoregion. Valleys are generally wide, low gradient, and flat-shaped with gentle to moderately steep side slopes. Fluvial geomorphic surfaces are active floodplains and overflow channels. Rosgen stream reach types adjacent to sites sampled are E3, E4, E6 and C4. Degraded stream reaches are F4 and F6 types. Stream sizes are 2-10 m wide with little debris affecting the active stream channel. This is the driest natural willow association. Soils are deep, erosive, moderately fine textured alluvium (Mollisols, Entisols, and one Histosol) and are often shallower to buried stream beds than the Booth willow-Geyer's willow/Aquatic sedge and Booth willow-Geyer's willow/Bladder sedge Associations. Surface soil textures are fine sandy to silty clay loams. These sites are periodically flooded during spring runoff (typically April or May) but the water table is well down in the rooting zone by mid July. Available water holding capacity is moderately high.

Valley Environment	Average	Range
Elevation (ft)	4922	3800-7000
Plot Slope (%)	1	0-3
Valley Width (m)	162	20-350
Valley Gradient (%)	2	1-7
Valley Sideslopes (%)	38	15-45
Soil Characteristics		
Water Table Depth (cm)	56	8-150
Rooting Depth (cm)	36	18-51
Depth to 30% Coarse Fragments (cm)	42	8-69
Soil Surface Cover (%)		
Submerged	10	0-80
Bare Ground	18	0-75
Gravel	tr	0-3
Rock	tr	0-5
Moss	5	0-70
Liverwort	2	0-20
Litter	68	14-100

Vegetation Composition

The willow/woolly sedge association is dominated by Geyer, Booth, and/or Lemmon willows (averaging 3.2m in height and ranging from 1.5-6.2 m). Golden currant (*Ribes aureum*), prickly currant, baldhip rose (*Rosa gymnocarpa*), and MacKenzie's willow (*Salix prolixa*) may be scattered through the shrub understory. The herbaceous layer is usually dominated by woolly sedge, although the cover may be sparse if the site is heavily grazed. Kentucky bluegrass is often abundant and will become the dominant graminoid with continuous overgrazing. Otherwise the streams and channels are characterized by a sward of woolly sedge. The rich forb component includes plants such as yarrow, northern bedstraw, large-leaved avens, dandelion, slender cinquefoi and Oregon checkermallow. The herbaceous layer averages 40 cm and ranges from 28 to 71 cm in height. Herbaceous biomass averages 1255 lbs/acre, ranging from 605 to 2000 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Geyer's willow (*Salix geyeriana*)	68	25	1-70
Booth willow (*Salix boothii*)	68	24	5-65
Lemmon willow (*Salix lemmonii*)	42	28	2-70
Prickly currant (*Ribes lacustre*)	37	8	2-20
SEDGES and RUSHES			
Woolly sedge (*Carex pellita*)	95	32	2-75
Baltic rush (*Juncus balticus*)	48	7	tr-30
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	84	19	tr-70
PERENNIAL FORBS			
Large-leaf avens (*Geum macrophyllum*)	84	3	tr-15
Yarrow (*Achillea millefolium*)	68	2	tr-7
Slender cinquefoil (*Potentilla gracilis*)	53	3	tr-15
Northern bedstraw (*Galium boreale*)	42	3	tr-13
Dandelion (*Taraxacum officinale*)	42	1	tr-4
Oregon checkermallow (*Sidalcea oregana*)	42	1	tr-5

Adjacent Vegetation

Vegetation types adjacent to sites sampled are:
terraces – Big sagebrush/Cusick's bluegrass, Lodgepole pine/Kentucky bluegrass, big sagebrush/Idaho fescue - Bluebunch wheatgrass, Ponderosa pine/common snowberry;
sideslopes - lodgepole pine/pinegrass, ponderosa pine/Idaho fescue-bluebunch wheatgrass, ponderosa pine/big sagebrush/Idaho fescue-bluebunch wheatgrass, ponderosa pine/common snowberry, ponderosa pine/Geyer's sedge, lodgepole pine/pinegrass and Western juniper/big sagebrush.

Successional Dynamics

It was difficult to find stands of this type in late seral and climax ecological status. With overuse by livestock, Kentucky bluegrass and forbs become co-dominant with woolly sedge and eventually dominate the stand. Woolly sedge retreats to the willow understory. Willow vigor may decline as evidenced by uneven stem distribution, highlining, dead clumps, and decreasing canopy cover. Soils become trampled and the litter layer is broken. The vegetation may be changed to willow/ Kentucky bluegrass or Kentucky bluegrass communities.

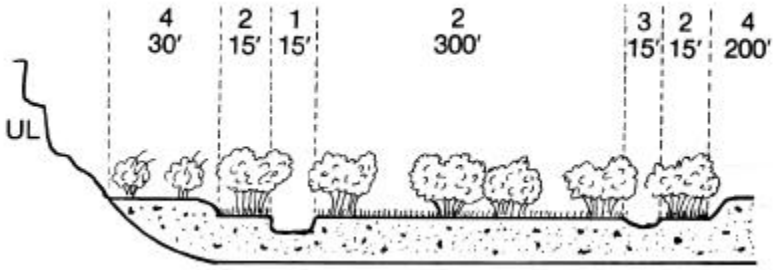
Continued overuse may lead to increased streambank erosion. Streambed downcutting may occur and result in lowered water tables throughout the landform. Under these hydrologic conditions the site potential may be changed from Booth willow-Geyer's willow/woolly sedge to big sagebrush/Cusick bluegrass.

Other Studies Documenting Association with Plot Data

Oregon: Kovalchik (1987) and Crowe and Clausnitzer (1997) described this association under the name *Salix/Carex lanuginosa.*
Utah and southeastern Idaho: Padgett *et al.* (1989) described Booth willow/Mesic graminoid and Geyer willow/Mesic graminoid community types that correspond to this association.

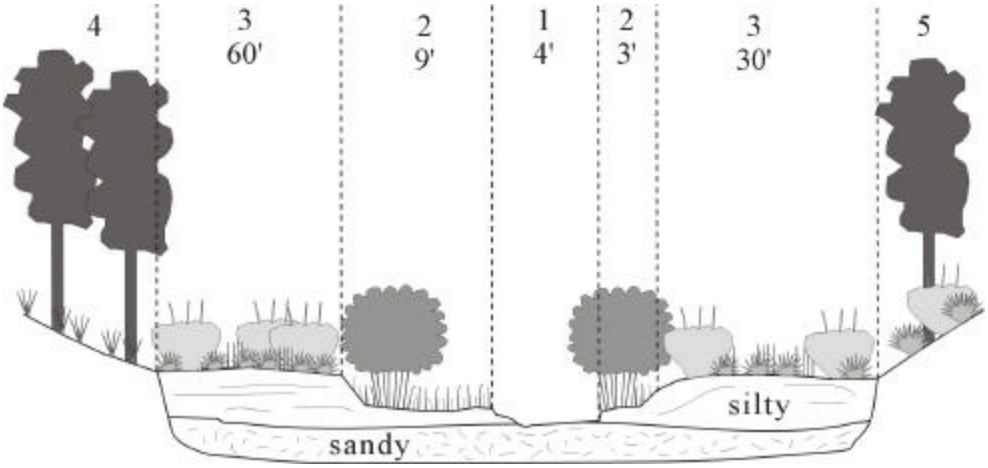
Illustrations

1 Silver Creek, third order
2 **Booth willow-Geyer's willow/woolly sedge**, active floodplain
3 **Booth willow-Geyer's willow/woolly sedge**, overflow channel
4 **Silver sagebrush/Cusick bluegrass**, terrace or inactive floodplains



Silver Creek; low gradient, low elevation floodplain; Ochoco Mountains Physiographic Area.

1 C5 stream reach
2 **Booth willow-Geyer's willow/woolly sedge** floodplain
3 **Mountain big sagebrush/Cusick's bluegrass**, terrace
4 Ponderosa pine/elk sedge, southwest-facing sideslope
5 Ponderosa pine/big sagebrush/Idaho fescue-bluebunch wheatgrass, northeast-facing sideslope



Pine Creek, Burns RD, Malheur NF: very low gradient, mod. elevation, flat-shaped valley Province

Salix geyeriana/Deschampsia cespitosa-Carex nebrascensis Association

Geyer willow/Tufted hairgrass-Nebraska sedge Association
1 plot. CEGL001208

Ecoregional Range
BM, EC

Environment and Soils
One plot was sampled at 4600 ft. elevation in a low gradient valley. Microtopography is flat on a broad, moist floodplain with an organic loam soil. The surface organic layer is 45 cm thick and the water table depth was 5 cm at the time of sampling. 90% of the soil surface was bare and 10% covered by litter.

Vegetation Composition
Geyer's willow and golden currant form a scattered shrub overstory. The site is on the moist end of tufted hairgrass distribution and Nebraska sedge is nearly co-dominant with hairgrass in the herbaceous layer. Other graminoids and forbs are scattered through the herbaceous layer in small amounts.

Dominant Species	Canopy Cover (%)
SHRUBS	
Geyer's willow (*Salix geyeriana*)	25
Golden currant (*Ribes aureum*)	15
SEDGES and RUSHES	
Nebraska sedge (*Carex nebrascensis*)	20
Baltic rush (*Juncus balticus*)	10
Slender-beaked sedge (*Carex athrostachya*)	2
PERENNIAL GRASSES	
Tufted hairgrass (*Deschampsia cespitosa*)	40
Kentucky bluegrass (*Poa pratensis*)	2
Meadow barley (*Hordeum brachyantherum*)	2
PERENNIAL FORBS	
Water montia (*Montia chamissoi*)	5
Slender cinquefoil (*Potentilla gracilis*)	2
Duckweed (*Lemna minor*)	2
Alpine willow-herb (*Epilobium alpinum*)	2
Western coneflower (*Rudbeckia occidentalis*)	2
Sweet-scented bedstraw (*Galium trifolium*)	2

Successional Dynamics
This association may be the result of the accumulation of sediments and subsequent lowering of the seasonal water table on the site. If the site becomes drier it may succeed to a sagebrush or Lodgepole pine association.

Other Studies Documenting Association with Plot Data
none

Salix geyeriana-Salix lemmonii/Juncus balticus Association

Geyer willow-Lemmon willow/Baltic rush Association
3 plots. New type

Valley Environment	Average	Range
Elevation (ft)	4000	--
Plot Slope (%)	0.5	--
Valley Width (m)	350	--
Valley Gradient (%)		
Valley Sideslopes (%)	15	--
Soil Surface Cover (%)		
Submerged	tr	0-tr
Bare Ground	12	tr-25
Gravel	-	
Rock	-	
Moss	2	tr-5
Litter	87	70-100

Ecoregional Range
BM?, EC

Environment and Soils
The Geyer willow-Lemmon willow/Baltic rush Association was sampled in the East Cascades Ecoregion, but probably occurs also in the Blue Mountains and possibly in the Basin and Range Ecoregions. Valleys are very wide, southeast-facing and flat-shaped with very low gradients, and gentle sideslopes. Sites are wet meadows associated with Rosgen E6 stream reach types.

Vegetation Composition
Geyer and sometimes Lemmon willows comprise the shrub overstory. The herbaceous layer is dominated by Baltic rush with a variety of other graminoids and forbs scattered through the sites at low cover, including bladder sedge, shortbeak sedge, western asger, western polemonium, water hemlock and bog saxifrage.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Geyer's willow (*Salix geyeriana*)	100	25	20-35
Lemmon willow (*Salix lemmonii*)	67	10	tr-20
SEDGES and RUSHES			
Baltic rush (*Juncus balticus*)	100	40	30-60
Bladder sedge (*Carex utriculata*)	100	2	tr-3
Shortbeak sedge (*Carex simulata*)	67	tr	--
PERENNIAL GRASSES			
Bentgrass (*Agrostis* sp.)	100	8	--
Kentucky bluegrass (*Poa pratensis*)	100	3	--
PERENNIAL FORBS			
Western aster (*Aster occidentalis*)	100	8	3-13
Western polemonium (*Polemonium occidentale*)	100	3	--
Bog saxifrage (*Saxifraga oregana*)	100	1	tr-3
Water hemlock (*Cicuta douglasii*)	67	4	tr-8
Bedstraw (*Galium* sp.)	67	tr	--
Large-leaf avens (*Geum macrophyllum*)	67	tr	--
Curly dock (*Rumex crispus*)	67	tr	--
Willow-herb (*Epilobium* sp.)	67	tr	--
Paintbrush (*Castilleja* sp.)	67	tr	--

Successional Dynamics
This association froms as a result of overgrazing or other excessive ground disturbance on wetter tall willow/sedge associations such as *Salix boothii-Salix geyeriana/Carex utriculata* and *Salix boothii-Salix geyianan/Carex aquatilis*. With 10 or more years rest from ground disturbance, sites will probably succeed to one of these other tall willow associations.

Other Studies Documenting Association with Plot Data
none

Salix boothii-Salix lemmonii/Mesic Forb Association

Booth willow-Lemmon willow/Mesic Forb Association
9 plots. CEGL001186

Ecoregional Range
BM, BR?, EC

Environment and Soils

The Booth willow-Lemmon willow/Mesic Forb Association was sampled in the southeastern East Cascades (Warmer Mountains) and in the Blue Mountains Ecoregions. It may also occur in the Basin and Range Ecoregion. Valleys are V-, trough- and flat-shaped and moderately wide to wide, with low to very high gradients and gentle to steep sideslopes. Sites are floodplains and wet meadows. Soils are deep, fine-textured loams.

Valley Environment	Average	Range
Elevation (ft)	5537	4560-7000
Plot Slope (%)	5	1-25
Valley Width (m)	99	65-200
Valley Gradient (%)	5	1-25
Valley Sideslopes (%)	38	15-45
Soil Characteristics		
Current Water Table Depth (cm)	31	0-91
Thickness of Surface Organic Layer (cm)	46	18-80
Soil Surface Cover (%)		
Submerged	2	0-6
Bare Ground	30	5-70
Gravel	1	0-5
Rock	1	0-5
Moss	26	0-90
Litter	42	0-83

Vegetation Composition

Booth willow or Lemmon willow dominant the overstory shrub layer, which averages 3.9 m in height (ranging from 2.5 to 6.2 m). Many other shrubs are present at low to high cover in the shrub over- and understories, including bog birch, mountain alder, Geyer's willow, prickly currant, stinking swamp currant and bearberry honeysuckle. The herbaceous layer (averaging 68 cm in height, ranging from 51 to 91 cm) comprises a great variety of forbs and grasses and graminoids, including tall mannagrass, mountain brome, hairy willow-herb, sweet-scented bedstraw, stinging nettle, Columbia monkshood and alpine mitrewort. Herbaceous biomass averages 2155 lbs/acre (ranging from 433 to 4600 lbs/acre).

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are:
terraces – lodgepole pine/bluejoint reedgrass, Ponderosa pine/Common snowberry, and other lodgepole pine associations;
sideslopes – lodgepole pine/Grouse huckleberry, Subalpine fir/Twinflower, lodgepole pine-subalpine fir communities, Ponderosa pine/Big sagebrush/Idaho fescue-Bluebunch wheatgrass, Ponderosa pine/mountain snowberry and big sagebrush/Western needlegrass.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-SUBDOMINANTS			
Lodgepole pine (*Pinus contorta*)	22	1.5	1-2
TREE UNDERSTORY			
Lodgepole pine (*Pinus contorta*)	33	1	1-2
SHRUBS			
Booth willow (*Salix boothii*)	67	74	30-100
Bearberry honeysuckle (*Lonicera involucrata*)	56	12	1-35
Prickly currant (*Ribes lacustre*)	44	13	5-20
Stinking swamp currant (*Ribes hudsonianum*)	33	24	7-35
Mountain alder (*Alnus incana*)	33	23	5-40
Lemmon willow (*Salix lemmonii*)	22	70	65-75
Bog birch (*Betula nana*)	22	20	2-37
Geyer's willow (*Salix geyeriana*)	22	11	2-20
SEDGES and RUSHES			
Soft-leaved sedge (*Carex disperma*)	22	4	3-5
Widefruit sedge (*Carex angustata*)	22	4	3-5
Slender-beaked sedge (*Carex athrostachya*)	22	2	--
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	44	14	2-30
Mountain brome (*Bromus carinatus*)	33	4	tr-10
Bluejoint reedgrass (*Calamagrostis canadensis*)	33	4	tr-5
PERENNIAL FORBS			
Arrowleaf groundsel (*Senecio triangularis*)	67	5	tr-15
Large-leaf avens (*Geum macrophyllum*)	67	2	tr-5
Hairy willow-herb (*Epilobium ciliatum*)	67	1	tr-3
Sweet-scented bedstraw (*Galium trifolium*)	56	3	tr-5
Stinging nettle (*Urtica dioica*)	56	3	1-4
Columbia monkshood (*Aconitum columbianum*)	44	7	1-15
Yarrow (*Achillea millefolium*)	44	3	1-5
Alpine mitrewort (*Mitella pentandra*)	44	2	tr-5
Scarlet paintbrush (*Castilleja miniata*)	44	2	tr-3
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	44	2	tr-4

Successional Dynamics

This association may represent an early seral stage of other tall willow (*Salix boothii, Salix geyeriana, Salix lemmonii*) associations. It may also be a result of ground disturbance or deposition of fresh material on the ground surface beneath established stands of tall willows. Some sites sampled occurred along streams that were otherwise dominated by mountain alder associations and appeared to be a result of disturbance of the floodplain and streambanks by natural flooding or by human activities such as road building.

Other Studies Documenting Association with Plot Data

Oregon: Kovalchik (1987) described a *Salix*/monkshood association, which is encompassed in this association; Crowe and Clausnitzer (1997) described this association under the name Salix/Mesic Forb plant community type
Eastern Idaho-western Wyoming: Youngblood *et al.* 1985
Utah and southeastern Idaho: Padgett *et al.* 1989

Salix exigua (S. exigua ssp. exigua)-Dry Alluvial Bar Association

Coyote willow-Dry alluvial bar Association
22 plots. CEGL001200

Valley Environment	Average	Range
Elevation (ft)	2833	360-4800
Plot Slope (%)	2	0.5-6
Valley Width (m)	89	5-350
Valley Gradient (%)	4	2-10
Valley Sideslopes (%)	47	15-70
Soil Surface Cover (%)		
Submerged	12	0-70
Bare Ground	24	tr-75
Gravel	11	0-50
Rock	42	0-80
Moss	1	0-5
Litter	13	0-40

Ecoregional Range
BM, BR, CB, EC

Environment and Soils

This Coyote willow Association occurs at very low to moderate elevations throughout eastern Oregon. Valleys range from very narrow to very wide and are V-, trough, flat- and box-shaped. Valley gradients are moderate to high and sideslopes are gentle to moderately steep. Most sites have a high percentage of rock, gravel or bare ground cover as these sites are frequently flooded and overlain with fresh alluvial deposits. Rosgen stream reaches associated with sites vary widely and include: A1, A2,A3, B2, B3, C3, C4, D6, DA, E5 and F2. Soils are coarse fragment-rich and are generally composed of gravel or small cobble-sized material and have low water-holding capacity. This association is found on stream orders 1, 2, 3 and 4.

Vegetation Composition

Coyote willow forms the dense shrub overstory, averaging 1.8 m in height. The herbaceous layer, with the exception of one plot that has a dense sward of reed canarygrass, is composed of sparsely scattered forbs and graminoids, including field mint, curly dock, oxeye daisy, yarrow, meadow goldenrod, common plaintain and prairie sage and averages 31 cm in height. Herbaceous biomass averages 1125 lbs/acre, ranging from 166-3776 lbs/acre).

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Coyote willow (*Salix exigua*)	100	53	15-90
MacKenzie's willow (*Salix prolixa*)	36	12	tr-50
Shining willow (*Salix lucida* ssp. *lasiandra*)	27	+3	tr-5
SEDGES and RUSHES			
Creeping spikerush (*Eleocharis palustris*)	41	1	tr-1
Baltic rush (*Juncus balticus*)	27	1	tr-2
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	41	1	tr-3
PERENNIAL FORBS			
Curly dock (*Rumex crispus*)	46	tr	tr-5
Field mint (*Mentha arvensis*)	41	1	tr-3
Yarrow (*Achillea millefolium*)	27	1	tr-1
Yellow sweetclover (*Melilotus officinalis*)	27	1	tr-1
Prairie sage (*Artemisia ludoviciana*)	23	3	tr-6
Meadow goldenrod (*Solidago canadensis*)	23	2	tr-8
Oxeye daisy (*Chrysanthemum leucanthemum*)	23	1	tr-3
Teasel (*Dipsacus sylvestris*)	23	1	tr-1
Common plantain (*Plantago major*)	23	tr	--
ANNUAL GRASSES and FORBS			
Cheatgrass (*Bromus tectorum*)	41	1	tr-3
Common mullein (*Verbascum thapsus*)	36	1	tr-1

Adjacent Vegetation
This association occurs predominantly in ponderosa pine (*Pinus ponderosa*), western juniper (*Juniperus occidentalis*), and big sagebrush (*Artemisia tridentata*) upland vegetation zones.

Successional Dynamics
Coyote willow is a rhizomatous species that colonizes newly formed alluvial bars along streams of all sizes. It is an excellent soil stabilizer with a deep root system and flexible stems that can withstand flooding. Coyote willow reduces erosion potential by increasing the friction of stream flow, trapping sediments and building a protected seed bed for a number of tree and shrub species (Kittel *et al.* 1999). Succession without disturbance may lead to a greater understory cover, which, in turn, facilitates the establishment of shrub and tree seedlings (Kittel *et al.* 1999) and leads to the development of other shrub and forested associations.

Other Studies Documenting Association with Plot Data
Oregon: Padgett 1981; Kovalchik 1987; Crowe and Clausnitzer (1997) described a Salix exigua association that includes sites corresponding to this association
Washington: Kovalchik 2000 described a Salix/Alluvial Bar Association that corresponds to this association
Montana: Hansen *et al.* 1995
Utah and southeastern Idaho: Padgett *et al.* 1989
Nevada: Manning and Padgett 1995
Wyoming and eastern Idaho: Youngblood *et al.* 1985
Colorado: Kittel *et al* 1999 described a Salix exigua/Barren Shrubland association that corresponds to this one.

Salix exigua/Eleocharis palustris-Schoenoplectus americanus Association

Coyote willow/Creeping spikerush-Three square bulrush Association
27 plots. New type

Valley Environment	Average	Range
Elevation (ft)	2889	1520-4350
Plot Slope (%)	3	tr-30
Valley Width (m)	71	20-200
Valley Gradient (%)	4	2-30
Valley Sideslopes (%)	54	45-70
Soil Surface Cover (%)		
Submerged	8	0-25
Bare Ground	40	3-95
Gravel	11	0-50
Rock	27	0-85
Moss	1	0-5
Litter	15	tr-55

Ecoregional Range
BM, BR, CB, EC

Environment and Soils
Valleys in which this occurs are moderately wide, box- and trough-shaped (and occasionally V- or flat-shaped) with moderate gradients (only one site had a valley gradient > 5%) with moderately steep to steep sideslopes. Sites are alluvial bars and streambanks that retain more water throughout the growing season than the *Salix exigua*-Dry Alluvial Bar Association. Rosgen stream reach types associated with sites sampled are B2, B3, B4, C3 and D3. Most streambeds have a cobble substrate. This association is found on stream orders 3 and 4.

Vegetation Composition
Schoenoplectus americanus and/or Eleocharis palustris have at least 5% cover or the site has at least 10% cover of Carex lanuginosa, Equisetum arvense, Phalaris arundinacea, Conium maculatum or Schoenoplectus acutus/S. validus any of which indicate wet sites conditions on at least a portion of the site. These sites are generally backwater locations on large alluvial bars. Height of herbaceous layer averages 31 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Coyote willow (*Salix exigua*)	100	58	8-90
MacKenzie's willow (*Salix prolixa*)	52	12	tr-50
Wood's rose (*Rosa woodsii*)	52	1	tr-3
Red-osier dogwood (*Cornus sericea*)	30	2	tr-3
SEDGES and RUSHES			
Creeping spikerush (*Eleocharis palustris*)	82	11	tr-30
Threesquare bulrush (*Schoenoplectus americanus*)	63	13	tr-30
Woolly sedge (*Carex pellita*)	44	9	tr-30
Baltic rush (*Juncus balticus*)	37	2	tr-3
Hardstem bulrush (*Schoenoplectus acutus*)	30	3	tr-15
Small-fruit bulrush (*Scirpus microcarpus*)	11	6	tr-15
Softstem bulrush (*Schoenoplectus validus*)	4	15	--
PERENNIAL GRASSES			
Reed canarygrass (*Phalaris arundinacea*)	63	8	tr-80
Creeping bentgrass (*Agrostis stolonifera*)	48	4	tr-20
Kentucky bluegrass (*Poa pratensis*)	41	1	tr-10
PERENNIAL FORBS			
Curly dock (*Rumex crispus*)	63	1	tr-3
Field mint (*Mentha arvensis*)	52	1	tr-5
Meadow goldenrod (*Solidago canadensis*)	37	4	tr-20
Teasel (*Dipsacus sylvestris*)	30	1	tr-3
Rough cocklebur (*Xanthium strumarium*)	30	1	tr-1
Common plantain (*Plantago major*)	30	1	--
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	74	15	tr-60
Common scouring Rush (*Equisetum hyemale*)	37	1	tr-2

Adjacent Vegetation
This association occurs predominantly in ponderosa pine, western juniper, and big sagebrush upland vegetation zones.

Successional Dynamics
Coyote willow is a rhizomatous species that colonizes newly formed alluvial bars along streams of all sizes. It is an excellent soil stabilizer with a deep root system and flexible stems that can withstand flooding. Coyote willow reduces erosion potential by increasing the friction of stream flow, trapping sediments and building a protected seed bed for a number of tree and shrub species (Kittel *et al.* 1999). Succession without disturbance may lead to a greater understory cover, which, in turn, facilitates the establishment of shrub and tree seedlings (Kittel *et al.* 1999) and leads to the development of other shrub and forested associations.

Other Studies Documenting Association with Plot Data
none

Salix exigua-Salix lucida ssp. lasiandra-Cornus serecia Association

Coyote willow-Shining willow-Red-osier dogwood Association
7 plots. CEGL001204

Ecoregional Range
BM, BR, CB?, EC?

Environment and Soils
The Coyote willow-shining willow-red-osier dogwood/Creeping spikerush Association occurs in the Blue Mountains and Northern Basin and Range Ecoregions. This association occurs at higher elevations than the Coyote willow-Dry Alluvial Bar and Coyote willow/Creeping spikerush-American bulrush Associations. Valleys have moderate gradients, are moderately wide to wide, V-, box- and trough-shaped and have moderately steep to steep sideslopes. Fluvial surfaces are streambanks and alluvial bars. Rosgen stream reach types adjacent to sites sampled are B2, B3, C3 and C4. This association is found on stream orders 3 and 4.

Valley Environment	Average	Range
Elevation (ft)	3871	2700-5300
Plot Slope (%)	3	1-6
Valley Width (m)	104	20-200
Valley Gradient (%)	3	2-7
Valley Sideslopes (%)	52	45-70
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	15	5-30
Gravel	22	10-30
Rock	42	5-85
Cryptogam	7	0-20
Litter	15	tr-40

Vegetation Composition
The shrub overstory is a dense thicket of coyote willow, and often, shining willow and red-osier dogwood. Wood's rose is present occasionally in the shrub understory. The herbaceous layer is sparse. The most commonly found herbaceous species include creeping spikerush, teasel, curly dock, meadow goldenrod and common horsetail.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Coyote willow (*Salix exigua*)	100	36	15-70
Shining willow (*Salix lucida* ssp. *lasiandra*)	85	26	3-70
Red-osier dogwood (*Cornus sericea*)	71	31	13-63
Wood's rose (*Rosa woodsii*)	43	6	tr-15
SEDGES and RUSHES			
Creeping spikerush (*Eleocharis palustris*)	72	5	tr-20
PERENNIAL FORBS			
Teasel (*Dipsacus sylvestris*)	57	1	tr-3
Curly dock (*Rumex crispus*)	57	1	--
Meadow goldenrod (*Solidago canadensis*)	43	8	1-20
Brewer's bittercress (*Cardamine breweri*)	43	tr	--
Field mint (*Mentha arvensis*)	43	tr	--
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	43	1	tr-1

Adjacent Vegetation

This association occurs predominantly in ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*) and Grand fir (*Abies grandis*) upland vegetation zones.

Successional Dynamics

Coyote willow is a rhizomatous species that colonizes newly formed alluvial bars along streams of all sizes. It is an excellent soil stabilizer with a deep root system and flexible stems that can withstand flooding. Coyote willow reduces erosion potential by increasing the friction of stream flow, trapping sediments and building a protected seed bed for a number of tree and shrub species (Kittel *et al.* 1999). Succession without disturbance may lead to a greater understory cover, which, in turn, facilitates the establishment of shrub and tree seedlings (Kittel *et al.* 1999) and leads to the development of other shrub and forested associations. On streambanks along Rosgen B-type streams where there is unlikely to be a build up of sediments, this association may never succeed to another association.

Other Studies Documenting Association with Plot Data

Oregon: Myhre and Clements 1972:5.

Salix prolixa (S. rigida ssp. mackenziana)-Rosa woodsii Association

Mackenzie's willow-Wood's rose Association
10 plots. CEGL003452

Valley Environment	Average	Range
Elevation (ft)	3898	2720-4900
Plot Slope (%)	12	0.5-55
Valley Width (m)	78	5-200
Valley Gradient (%)	7	2-10
Valley Sideslopes (%)	56	45-70
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	32	0-70
Gravel	17	tr-50
Rock	4	0-15
Moss	2	0-5
Litter	42	7-76

Ecoregional Range
BM, BR, CB

Environment and Soils
The Mackenzie's willow-Wood's rose Association is found in the Blue Mountains, Basin and Range, and Columbia Basin Ecoregions. Valleys range from narrow to wide, are V-, trough- and flat-shaped and have moderate to high gradients and moderately steep to steep sideslopes. Fluvial surfaces are alluvial bars and streambanks. Most sites have abundant bare ground, gravel or rock exposed on the soil surface. Rosgen stream reach types associated with sites sampled are A4, B3, B4, B5 and C3. This plant association is found on stream orders 3 and 4.

Vegetation Composition
MacKenzie's willow forms a scattered to dense shrub overstory. Wood's rose is present in the shrub understory in half of the communities sampled. Other shrub species that are occasionally present are red-osier dogwood, Lewis' mockorange, common chokecherry, black hawthorn, shining willow and poison ivy. The herbaceous layer is sparse to moderately populated with a variety of grasses, graminoids and forbs, including Baltic rush, creeping spikerush, yarrow, curly dock, western clematis, stining nettle, prairie sage and meadow goldenrod. On sites that are more degraded, Kentucky bluegrass and creeping bentgrass are abundant. The height of the herbaceous layer averages 76 cm.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
MacKenzie's willow (*Salix prolixa*)	100	46	6-90
Wood's rose (*Rosa woodsii*)	50	6	tr-20
Red-osier dogwood (*Cornus sericea*)	50	4	tr-13
Lewis' mockorange (*Philadelphus lewisii*)	40	4	tr-8
Common chokecherry (*Prunus virginiana*)	30	9	3-15
Black hawthorn (*Crataegus douglasii*)	30	5	3-10
Shining willow (*Salix lucida* ssp. *lasiandra*)	30	2	tr-5
Poison ivy (*Toxidendron rhydbergii*)	20	11	1-20
SEDGES and RUSHES			
Baltic rush (*Juncus balticus*)	30	5	tr-30
Creeping spikerush (*Eleocharis palustris*)	20	8	3-13
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	80	5	tr-30
Creeping bentgrass (*Agrostis stolonifera*)	40	16	tr-30
PERENNIAL FORBS			
Yarrow (*Achillea millefolium*)	90	tr	--
Curly dock (*Rumex crispus*)	50	tr	--
Western clematis (*Clematis ligusticifolia*)	40	2	tr-3
Stinging nettle (*Urtica dioica*)	40	1	tr-3
Meadow goldenrod (*Solidago canadensis*)	30	4	tr-6
Prairie sage (*Artemisia ludoviciana*)	30	3	tr-8
Catnip (*Nepeta cataria*)	30	1	tr-3

Adjacent Vegetation
terraces – Lodgepole pine/California false hellebore;
sideslopes – Western juniper associations; Douglas fir associations; Grand fir/Grouse huckleberry-Twinflower, Grand fir/pinegrass; Ponderosa pine/Idaho fescue-Bluebunch wheatgrass and other grand fir associations.

Successional Dynamics
This association may succeed to other riparian shrub associations given stabilization of sites and accumulation of sediments on the soil surface.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer (1997) described a *Salix rigida* plant community type that is included in this association.
Nevada: Manning and Padgett (1995) described a *Salix lutea-Rosa woodsii* type that is similar to this association

Salix lucida ssp. lasiandra Association

Shining willow Association
10 plots. CEGL003118

Ecoregional Range
BM, BR, EC

Environment and Soils
The Shining willow Association occurs at moderately high elevations in the Blue Mountains, Basin and Range, and East Cascades Ecoregions. Valleys are narrow to moderately wide and V- and trough-shaped with moderate gradients and gentle to steep sideslopes. Fluvial geomorphic surfaces are streambanks, alluvial bars and incipient floodplains. Associated Rosgen stream reach types are predominantly fast-flowing A2,B2, B3. There was one E4 type among the sampled sites. The soil surface is generally rocky and soils are coarse fragment-rich.

Valley Environment	Average	Range
Elevation (ft)	5064	4680-5400
Plot Slope (%)	3	1-7
Valley Width (m)	43	20-65
Valley Gradient (%)	3	2-5
Valley Sideslopes (%)	50	15-70
Soil Surface Cover (%)		
Submerged	6	0-35
Bare Ground	12	5-20
Gravel	16	5-40
Rock	42	5-70
Moss	8	0-35
Litter	11	5-20

Vegetation Composition
Shining willow is the dominant overstory shrub and forms a sparse to dense canopy. Red-osier dogwood, MacKenzie's willow and Wood's rose are occasional shrub associates. The herbaceous understory is sparse and is populated with a wide variety of grasses, graminoids and forbs present in small amounts including, prairie sage, field mint, meadow goldenrod, western St. John's wort, creeping spikerush and woolly sedge.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Shining willow (*Salix lucida* ssp. *lasiandra*)	100	39	10-60
Red-osier dogwood (*Cornus sericea*)	50	8	1-30
MacKenzie's willow (*Salix prolixa*)	40	10	3-15
Wood's rose (*Rosa woodsii*)	40	2	tr-3
SEDGES and RUSHES			
Creeping spikerush (*Eleocharis palustris*)	50	2	tr-8
Woolly sedge (*Carex pellita*)	40	2	tr-3
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	50	1	tr-3
Creeping bentgrass (*Agrostis stolonifera*)	40	1	tr-3
PERENNIAL FORBS			
Prairie sage (*Artemisia ludoviciana*)	70	3	tr-15
Field mint (*Mentha arvensis*)	50	2	tr-8
Meadow goldenrod (*Solidago canadensis*)	40	1	tr-3
Western St. John's wort (*Hypericum formosum*)	30	2	tr-5
Sweet-scented bedstraw (*Galium trifolium*)	30	2	tr-3
Hairy willow-herb (*Epilobium ciliatum*)	30	1	tr-3
Meadow arnica (*Arnica chamissonis*)	30	1	tr-2
Yarrow (*Achillea millefolium*)	30	1	tr-2
Red columbine (*Aquilegia formosa*)	30	tr	--
Slender cinquefoil (*Potentilla gracilis*)	30	tr	--
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	50	10	tr-20

Successional Dynamics

This association will remain relatively stable so long as site characteristics remain the same. If sediments build up and a layer of fine-textured soil material accumulates on alluvial bars and incipient floodplains, the association will probably succeed to another riparian shrub association. If the site builds up sediments and still retain high water tables, succession will likely be to the Shining willow/Wet graminoid Association.

Other Studies Documenting Association with Plot Data

Montana: Hansen *et al.* 1995

Colorado: Kittel *et al.* (1999) described a *Salix lucida* Association that includes this association

Salix lucida ssp. lasiandra / Wet graminoid Association

Shining willow/Wet graminoid Association
8 plots. New type

Ecoregional Range
BM, BR, EC

Environment and Soils
This occurs at moderate elevations in the Blue Mountains, Basin and Range and East Cascades Ecoregions. It is found in flat and trough shaped, narrow to wide valleys with moderate gradients and gentle to moderately steep sideslopes. Fluvial geomorphic surfaces are floodplains along Rosgen E4, E6 and one B2 stream reach types. Soils are much wetter and more fine-textured than in the Shining willow Association.

Valley Environment	Average	Range
Elevation (ft)	4768	4400-5280
Plot Slope (%)	1	0.5-4
Valley Width (m)	134	20-350
Valley Gradient (%)	3	2-5
Valley Sideslopes (%)	36	15-70
Soil Surface Cover (%)		
Submerged	15	0-60
Bare Ground	37	5-75
Gravel	5	0-10
Rock	5	0-30
Moss	5	0-20
Litter	24	10-85

Vegetation Composition
Shining willow dominates the shrub overstory. Coyote willow is a common co-dominant. A variety of moist graminoids comprise the majority of the herbaceous layer, all of which indicate wet site conditions during the growing season. In this association, there is 15% cover of one or a combination of Baltic rush, woolly sedge, Nebraska sedge, as well as the presence, usually in high cover amount, of aquatic sedge, bladder sedge, shortbeak sedge, Nevada rush or smallfruit bulrush. Other commonly occurring grasses and forbs are tufted hairgrass, meadow barley, field mint, curly dock, hairy willow-herb, meadow arnica, slender cinquefoil and common scouring rush.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Shining willow (*Salix lucida* ssp. *lasiandra*)	100	37	3-70
Coyote willow (*Salix exigua*)	75	21	tr-80
Lemmon willow (*Salix lemmonii*)	38	6	tr-13
SEDGES and RUSHES			
Baltic rush (*Juncus balticus*)	88	11	1-20
Woolly sedge (*Carex pellita*)	75	10	tr-20
Nebraska sedge (*Carex nebrascensis*)	63	25	3-60
Creeping spikerush (*Eleocharis palustris*)	63	17	8-30
Small-fruit bulrush (*Scirpus microcarpus*)	50	15	tr-30
Nevada sedge (*Juncus nevadensis*)	50	7	1-15
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	63	1	tr-3
Common timothy (*Phleum pratense*)	63	1	tr-1
Creeping bentgrass (*Agrostis stolonifera*)	50	4	tr-8
Meadow barley (*Hordeum brachyantherum*)	38	tr	--
Tufted hairgrass (*Deschampsia cespitosa*)	25	4	tr-8
PERENNIAL FORBS			
Field mint (*Mentha arvensis*)	100	4	tr-20
Curly dock (*Rumex crispus*)	75	1	tr-3
Hairy willow-herb (*Epilobium ciliatum*)	63	2	tr-8
Meadow arnica (*Arnica chamissonis*)	50	5	1-15
Slender cinquefoil (*Potentilla gracilis*)	50	1	tr-3
Yarrow (*Achillea millefolium*)	50	tr	--
FERNS and HORSETAILS			
Common scouring rush (*Equisetum hyemale*)	50	1	tr-1

Successional Dynamics
This association probably occurs where fine-textured sediments have built up on alluvial bars and sites have developed into floodplains. This association may develop from the Shining willow Association.

Other Studies Documenting Association with Plot Data
Montana: Hansen *et al.* 1995
Colorado: Kittel *et al.* (1999) described a *Salix lucida* Association that includes this association

Salix scouleriana Association

Scouler willow Association
5 plots. New type

Valley Environment	Average	Range
Elevation (ft)	4302	1510-6400
Plot Slope (%)	14	2-30
Valley Width (m)	50	20-65
Valley Gradient (%)	14	2-30
Valley Sideslopes (%)	62	45-70
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	25	0-37
Gravel	-	-
Rock	7	0-15
Cryptogam	3	0-10
Litter	65	48-90

Ecoregional Range
BM, BR, EC

Environment and Soils
This Scouler willow Association occurs in the East Cascades, Blue Mountains, and Northern Basin and Range Ecoregions. Valleys are box-, trough- and V-shaped and narrow to moderately wide with moderate to very high gradients and moderately steep to steep sideslopes. Sites are streambanks and floodplains. Soils are composed of mineral materials with silt loam to sandy clay loam surface layer textures. Soils are generally well-drained and water tables drop below the rooting depth of most herbaceous species by the middle of the growing season. Rosgen stream reach types associated with sites sampled include B3 and B6. This association is found on stream orders 1, 2 and 3.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-SUBDOMINANTS			
Grand fir (*Abies grandis*)	40	5	--
TREE UNDERSTORY			
Grand fir (*Abies grandis*)	40	2	--
SHRUBS			
Scouler willow (*Salix scouleriana*)	100	60	38-85
Red-osier dogwood (*Cornus sericea*)	80	9	tr-15
Sticky currant (*Ribes viscossisimum*)	40	5	--
Wood's rose (*Rosa woodsii*)	40	3	--
Lewis' mockorange (*Philadelphus lewisii*)	40	3	--
Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*)	40	tr	--
SEDGES and RUSHES			
Swordleaf rush (*Juncus ensifolius*)	40	tr	--
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	60	27	5-70
Kentucky bluegrass (*Poa pratensis*)	60	1	tr-1
Tall mannagrass (*Glyceria striata*)	40	4	2-5
Creeping bentgrass (*Agrostis stolonifera*)	40	3	--
PERENNIAL FORBS			
Yarrow (*Achillea millefolium*)	60	2	tr-5
Hairy willow-herb (*Epilobium ciliatum*)	60	2	tr-5
Yellow monkeyflower (*Mimulus guttatus*)	60	2	tr-5
Stinging nettle (*Urtica dioica*)	40	2	tr-4
Western clematis (*Clematis ligusticifolia*)	40	2	tr-3
Sweet-scented bedstraw (*Galium trifolium*)	40	1	tr-1
Nettleleaf horsemint (*Agastache urticifolia*)	40	1	tr-1
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	60	3	tr-5
ANNUAL FORBS			
Common mullein (*Verbascum thapsus*)	40	tr	--

Vegetation Composition
Scouler willow dominates the shrub overstory. Other shrub species such as red-osier dogwood, sticky currant, Wood's rose, Lewis' mockorange and mountain big sagebrush are occasionally scattered through the shrub understory at low coverages. Blue wildrye has the both high constancy and moderate to high cover in this association. Other common herbaceous species are yarrow, hairy willow-herb, yellow monkeyflower and common horsetail.

Successional Dynamics
This association is probably successional to conifer associations.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997

Salix lasiolepis-Rosa woodsii-Cornus sericea ssp. sericea

Arroyo willow-Wood's rose-Red-osier dogwood Association
18 plots. CEGL001217

Ecoregional Range
BM, BR, CB

Environment and Soils

This association was sampled at low elevations in the eastern portions of the Basin and Range Ecoregion and at moderate elevations in the western mountains. It is also found in the Columbia Basin and Blue Mountains Ecoregions. Valleys are V-, box- and trough-shaped and very narrow to moderately wide with moderately high to high gradients and moderately steep to very steep sideslopes. Fluvial geomorphic sites are streambanks. Rosgen stream reach types adjacent to sites sampled are mostly A2, but a few are B3 and one is a C3. This association is found on stream orders 1, 2 and 3.

Valley Environment	Average	Range
Elevation (ft)	4364	2540-5860
Plot Slope (%)	7	1-20
Valley Width (m)	28	5-65
Valley Gradient (%)	7	2-10
Valley Sideslopes (%)	55	15-70
Soil Surface Cover (%)		
Submerged	1	0-5
Bare Ground	25	5-100
Gravel	9	0.5-15
Rock	23	0.5-40
Moss	2	0-10
Litter	41	0.5-70

Vegetation Composition

Arroyo willow dominates the shrub overstory. The shrub understory is populated with Wood's rose, red-osier dogwood, golden currant and/or MacKenzie's willow. Western clematis is found on almost 70% of sites and is the dominant herbaceous species. Other occasional grasses and forbs are blue wildrye, yarrow and hairy willow-herb. Sites generally have a high percentage of bare ground.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
SHRUBS			
Arroyo willow (*Salix lasiolepis*)	100	45	15-80
Wood's rose (*Rosa woodsii*)	83	4	tr-10
Red-osier dogwood (*Cornus sericea*)	78	19	tr-60
Golden currant (*Ribes aureum*)	61	1	tr-3
MacKenzie's willow (*Salix prolixa*)	44	16	3-30
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	50	1	tr-1
Kentucky bluegrass (*Poa pratensis*)	29	tr	--
PERENNIAL FORBS			
Western clematis (*Clematis ligusticifolia*)	67	13	tr-30
Yarrow (*Achillea millefolium*)	50	tr	--
Hairy willow-herb (*Epilobium ciliatum*)	44	tr	--
ANNUAL GRASSES			
Cheatgrass (*Bromus tectorum*)	61	1	tr-1

Other Studies Documenting Association with Plot Data
Nevada: Manning and Padgett 1995

Salix lemmonii-Rosa woodsii Association

Lemmon's willow-Wood's rose Association
13 plots. CEGL002772

Ecoregional Range
BM, BR, CB, EC

Environment and Soils

The Lemmon willow-Wood's rose Association is found at moderate elevations in the Blue Mountains, Basin and Range, Columbia Basin, East Cascades and Owyhee Upland Ecoregions. Valleys are V- and trough-shaped and very narrow to moderately wide with moderate to high gradients and moderately steep to very steep sideslopes. Fluvial geomorphic surfaces are alluvial bars and streambanks. Most sites have a high percentage of rock or bare soil on the ground surface. Rosgen stream reach types adjacent to sites sampled include A2, A4, B2, B3, B4, C3, C4. This association is found on stream orders 2 and 3.

Valley Environment	Average	Range
Elevation (ft)	4309	2760-5650
Plot Slope (%)	6	0.5-30
Valley Width (m)	35	5-65
Valley Gradient (%)	6	2-10
Valley Sideslopes (%)	54	15-70
Soil Surface Cover (%)		
Submerged	4	0-15
Bare Ground	22	tr-70
Gravel	14	0-50
Rock	25	tr-80
Moss	tr	0-tr
Litter	35	5-100

Vegetation Composition

Lemmon willow forms a dense shrub overstory over Wood's rose and golden currant in the understory. Lewis' mockorange occurs at sparse to abundant canopy cover in many shrub overstories. The herbaceous layer consists of a variety of forbs and grasses including Douglas' wormwood, yarrow, curly dock, western clematis, stinging nettle, yellow monkey flower, meadow barley and Kentucky bluegrass.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	
SHRUBS			
Lemmon willow (*Salix lemmonii*)	100	71	40-98
Wood's rose (*Rosa woodsii*)	77	5	tr-20
Golden currant (*Ribes aureum*)	69	3	tr-8
Lewis' mockorange (*Philadelphus lewisii*)	46	17	3-30
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	77	2	tr-15
Meadow barley (*Hordeum brachyantherum*)	39	tr	--
PERENNIAL FORBS			
Yarrow (*Achillea millefolium*)	100	1	tr-3
Douglas' wormwood (*Artemisia douglasiana*)	69	1	tr-3
Curly dock (*Rumex crispus*)	69	tr	--
Western clematis (*Clematis ligusticifolia*)	46	6	1-20
Stinging nettle (*Urtica dioica*)	46	3	tr-8
Yellow monkeyflower (*Mimulus guttatus*)	46	2	tr-8
Menzie's fiddleneck (*Amsinckia retrorsa*)	46	tr	--
ANNUAL GRASSES			
Cheatgrass (*Bromus tectorum*)	92	1	tr-1

Other Studies Documenting Association with Plot Data
none

*Salix exigua/Carex sheldonii Association**

Coyote willow/Sheldon's sedge Association
1 plot. CEGL001203

Ecoregional Range
BM, BR?, CB?, EC?

Environment and Soils
The Coyote willow/Sheldon's sedge association was sampled only one time at 4308 ft. elevation in the High Lava Plains section of the Blue Mountains Ecoregion. It may occur in several other Ecoregions in eastern Oregon.

Vegetation Composition
Coyote willow forms a dense shrub canopy over a sward of Sheldon's sedge. Other shrub on the site include MacKenzie's willow, Wood's rose and red-osier dogwood. Other herbaceous species are bladder sedge, creeping spikerush, indianhemp and marsh skullcap.

Other Studies Documenting Association with Plot Data
Colorado: Kittell 1994.

Dominant Species	Canopy Cover (%)
SHRUBS	
Coyote willow (*Salix exigua*)	90
MacKenzie's willow (*Salix prolixa*)	3
Wood's rose (*Rosa woodsii*)	3
Red-osier dogwood (*Cornus sericea*)	tr
SEDGES and RUSHES	
Sheldon's sedge (*Carex sheldonii*)	30
Bladder sedge (*Carex utriculata*)	tr
Creeping spikerush (*Eleocharis palustris*)	tr
PERENNIAL FORBS	
Indianhemp (*Apocynum cannabinum*)	tr
Marsh skullcap (*Scutellaria galericulata*)	tr

LOW ELEVATION TREE ASSOCIATIONS

Abies grandis/Acer glabrum Association

Grand fir/Rocky Mountain maple Association
10 plots. CEGL000267

Ecoregional Range
BM

Environment and Soils
The grand fir/Rocky Mountain maple plant association occurs on low to mid-elevation streambanks, floodplains, and terraces in the northern and central portions of the Blue Mountains Ecoregion. Low to moderate gradient, narrow to moderately wide, V-shaped valleys are characteristic landforms but sites have been identified in steeper gradient, very wide valleys. Valleys are northeast-, northwest- and east-facing. Soils are composed of silt loam, sandy loam, and clay loam over gravels and cobbles.

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt, ash
Total Rooting Depth (cm)	avg. 22 (range: 15-28)
Depth to 80% Coarse Fragments (cm)	avg. 33 (range: 5-89)
Surface Layer	
Thickness (cm)	5-28
Texture(s)	silt loam, loam (high ash content), sandy loam
Coarse Fragments (%)	0-50, gravel
Roots	very fine: few to many fine: none to many medium: none to few coarse: few
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	0-71
Texture(s)	clay loam,silt loam (high ash content), sandy clay, clay loam
Coarse Fragments (%)	0-50, gravel
Roots	very fine: many fine: few to many medium: none to many coarse: none to few
Redoximorphic Features	none
Substrate	cobble, boulders

Valley Environment	Average	Range
Elevation (ft)	3852	2580-4450
Plot Slope (%)	5	0.5-27
Valley Width (m)	71	5-350
Valley Gradient (%)	5	2-10
Valley Sideslopes (%)	53	45-70
Local Climate		
Mean Annual Precipitation (in.)	29	20-40
Mean Annual Snowfall (in.)	80	48-99
Mean Annual Temp.(F)	43	41-45
Mean Minimum Temp. (F)	32	30-35
Mean Maximum Temp. (F)	50	51-57
Median Date of Last Spring Freeze	June 13	June2-June24
Median Date of First Fall Freeze	Sep 10	Sep 2-Sep 24
Soil Surface Cover (%)		
Submerged	tr	0-5
Bare Ground	2	0-10
Gravel	tr	0-5
Rock	2	0-8
Moss	22	0-60
Lichen	tr	0-2
Litter	62	25-99

Rosgen stream types identified were A2a, A4, B2, B3, B4 and C3 types. Most of the stream reaches were B4. Stream widths range from 0.5-25 m. This association has more precipitation and snowfall and a shorter frost-free period than the Grand fir/Rocky Mountain maple type.

Vegetation Composition

Grand fir dominates the overstory in late seral stands of the Abies grandis/Acer glabrum Association. Engelmann spruce is a late-seral overstory component with Douglas-fir, ponderosa pine, and western larch occurring earlier in the sere (Clausnitzer 1993). A diverse group of tall shrubs is characterized by Rocky Mountain maple. Mallow ninebark is a minor late-seral climax shrub on some sites. Common snowberry, baldhip rose, Lewis' mockorange, and western thimbleberry are occasionally abundant. Western serviceberry, birchleaf spiraea, and oceanspray are common or well represented on about half the sites. While herbaceous richness is high in this association, most species have low abundance individually. Sweet-scented bedstraw is constant in the understory with mean coverage of 4%. Mountain sweet-cicely, woods strawberry, starry false-Solomon's seal, trail plant, stream violet, heartleaf arnica, and baneberry are often associated in the understory. Height of shrub overstory averages 5.7 m, ranging from 1.5 to 9.2 m. Height of shrub understory averages 1.2 m, ranging from 0.6 to 1.5 m. The herbaceous layer averages 30.5 cm in height. Average herbaceous biomass is 607 lbs/acre, ranging from 25 to 2323 lbs/acre.

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are:
terraces – grand fir/Rocky Mountain maple
sideslopes - grand fir/Rocky Mountain maple, grand fir/ twinflower, grand fir/ pinegrass, Douglas fir/ mallow ninebark, Douglas-fir/oceanspray, Idaho fescue-Bluebunch wheatgrass.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Grand fir (Abies grandis)	70	29	8-60
Engelmann spruce (Picea engelmannii)	20	24	7-40
TREE OVERSTORY-SUBDOMINANTS			
Grand fir (*Abies grandis*)	30	11	3-17
Engelmann spruce (*Picea engelmannii*)	10	4	--
TREE UNDERSTORY			
Grand fir (*Abies grandis*)	80	5	tr-20
Engelmann spruce (*Picea engelmannii*)	30	2	--
SHRUBS			
Rocky Mountain maple (*Acer glabrum*)	100	40	4-80
Common snowberry (*Symphoricarpos albus*)	80	34	1-85
Western serviceberry (*Amelanchior alnifolia*)	70	4	tr-10
Baldhip rose (*Rosa gymnocarpa*)	60	12	tr-50
Birchleaf spiraea (*Spiraea betulifolia*)	50	4	tr-8
Lewis' mockorange (*Philadelphus lewisii*)	40	16	2-40
Thimbleberry (*Rubus parviflorus*)	40	13	tr-35
SEDGES and RUSHES			
Geyer's sedge (*Carex geyeri*)	40	4	tr-12
PERENNIAL GRASSES			
Western fescue (*Festuca occidentalis*)	60	1	tr-2
Columbia brome (*Bromus vulgaris*)	40	3	tr-7
PERENNIAL FORBS			
Sweet-scented bedstraw (*Galium trifolium*)	100	4	tr-12
Mountain sweet cicily (*Osmorhiza chilensis*)	80	6	tr-35
Woods strawberry (*Fragaria vesca*)	70	1	tr-4
Pathfinder (*Adenocaulon bicolor*)	60	2	tr-3
Starry false Solomon's seal (*Smilacina stellata*)	60	1	tr-2
Stream violet (*Viola glabella*)	50	11	1-30
Heart-leaf arnica (*Arnica cordata*)	50	8	tr-30
Baneberry (Actaea rubra)	50	2	tr-3
Enchanter's nightshade (*Circaea alpina*)	40	7	tr-25
Columbia monkshood (*Aconitum columbianum*)	40	5	tr-18
FERNS and HORSETAILS			
Brittle bladderfern (*Cystopteris fragilis*)	50	tr	--

Successional Dynamics

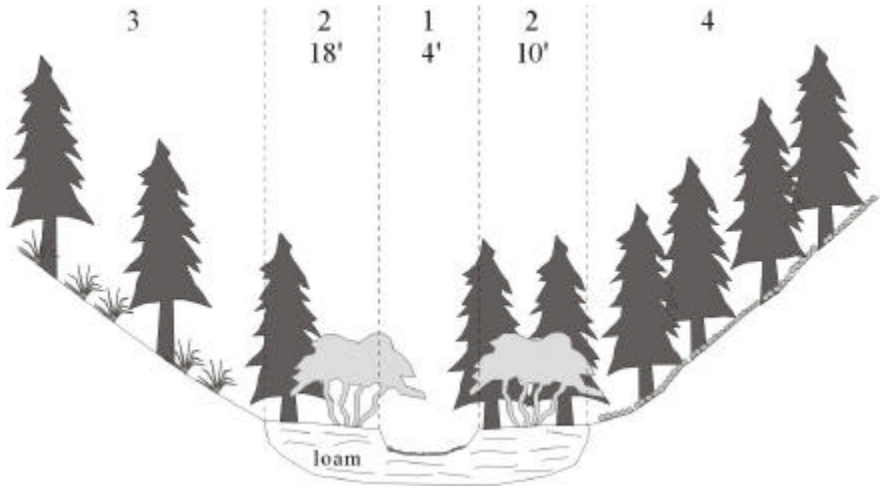
This association is considered a late seral community on the sites on which it occurs. Thus it is likely to be self-perpetuating without disturbance by fire or by a major flood scour or depositional event. Following fire, the characteristic shrub species, Rocky Mountain maple, common snowberry, western serviceberry, birchleaf spiraea, baldhip rose, Lewis' mockorange and thimbleberry, will readily resprout from root crowns or rhizomes. Grand fir, Douglas fir, western larch and Engelmann spruce are susceptible to moderately intense fires and will be killed. Ponderosa pine is more fire resistant. After fires Ponderosa pine and western larch may be the first colonizers of the site with grand fir and Engelmann spruce regenerating as shade increases and the soil surface becomes cooler and moisture under the increasing shrub canopy.

A major flood scour event that removes the relatively shallow fine-textured soil horizons, may produce a surface amenable to the development of the Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)/Rocky Mountain maple Association, which appears to be seral to this Grand fir/Rocky Mountain maple Association. A flood depositional event that deposits coarse-textured sediments on the site may be colonized by a shrub community dominated by many of the species characteristic of the Grand fir/Rocky Mountain maple Association with the possible addition of Mountain alder (*Alnus incana*), Red-osier dogwood (*Cornus sericea*) or Black hawthorn (*Crataegus douglasii*).

Other Studies Documenting Association with Plot Data

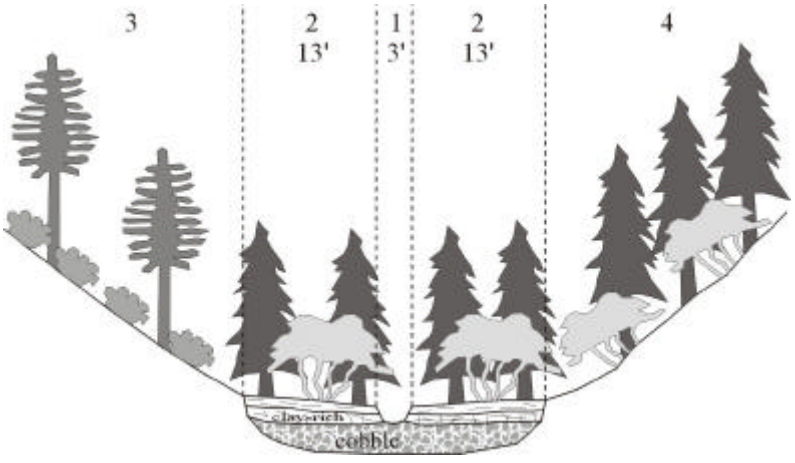
Oregon: Crowe and Clausnitzer 1997
Idaho: Steel *et al.* 1981

Illustrations



1 B4 stream reach
2 **Grand fir/Rocky Mountain maple**, floodplain
3 Grand fir/pinegrass, southeast-facing sideslope
4 Grand fir/twinflower, northwest-facing sideslope

Sunshine Creek; Long Creek RD, Malheur NF; moderately high gradient, moderate elevation, V-shaped valley; Blue Mountains Ecoregion



1 B4 stream reach
2 **Grand fir/Rocky Mountain maple**, floodplain
3 Douglas fir/Common snowberry, southeast-facing sideslope
4 Grand fir/Rocky Mountain maple, northwest-facing sideslope

Moderately high gradient, V-shaped valley; Blue Mountains Ecoregion

Abies grandis/Symphoricarpos albus Association

Grand fir/Common snowberry Association
5 plots. CEGL000282

Ecoregional Range
BM, EC

Environment and Soils
The grand fir/common snowberry community type was sampled on the Wallowa-Whitman and Malheur National Forests of the eastern Blue Mountains Ecoregion. Geomorphic surfaces are floodplains and terraces in narrow to moderately steep, moderately wide, V-, flat- and trough-shaped valleys with moderately steep sideslopes. Valley aspects range from southwest- to north- and northwest-facing. Rosgen stream types associated with sites sampled are B3, C4, C5 and E4. This association has less precipitation and snowfall and a longer frost-free period than the Grand fir/Rocky Mountain maple Association.

Valley Environment	Average	Range
Elevation (ft)	3754	2460-4640
Plot Slope (%)	2	1-5
Valley Width (m)	71	5-200
Valley Gradient (%)	4	2-5
Valley Sideslopes (%)	45	--
Local Climate		
Mean Annual Precipitation (in.)	22	15-36
Mean Annual Snowfall (in.)	71	32-153
Mean Annual Temperature ((F)	44	41-47
Mean Minimum Temperature (F)	33	31-37
Mean Maximum Temperature (F)	55	51-58
Median Date of Last Spring Freeze	June 10	May 22-June 24
Median Date of First Fall Freeze	Sep. 13	Sep 5-Sep 25
Soil Characteristics		
Rooting Depth (cm)	38	25-50
Soil Surface Cover (%)		
Submerged	tr	0-1
Bare Ground	6	0-20
Gravel	-	-
Rock	tr	0-1
Moss	46	0-90
Liverwort	tr	0-1
Litter	30	6-90

Vegetation Composition
Overstory vegetation is characterized by shade-tolerant grand fir; common seral tree species include Engelmann spruce, Douglas fir, ponderosa pine, lodgepole pine, and black cottonwood. Common snowberry dominates the shrub layer with prickly currant, mountain alder, Rocky Mountain maple, western thimbleberry, western serviceberry, Lewis' mockorange, red-osier dogwood, birchleaf spiraea and black hawthorn occasionally associated. Herbaceous species commonly encountered include heart-leaf arnica, enchanter's nightshade, pathfinder, starry false-Solomon's seal, yarrow, blue wildrye, and western fescue. The height of the shrub layer averages 0.6 m, and the height of the herbaceous layer averages 30 cm. Herbaceous biomass averages 346 lbs/acre.

Adjacent Vegetation
Adjacent upland vegetation types are:
terraces – grand fir/common snowberry;
sideslopes - grand fir/Geyer's sedge, lodgepole pine-(grand fir)/big huckleberry/pinegrass, grand fir/pinegrass and Idaho fescue-Bluebunch wheatgrass.

Successional Dynamics

The major species of this association, grand fir and common snowberry, are probably self-perpetuating given a lack of moderate to severe fires. Other associated tall shrubs, Rocky Mountain maple, western serviceberry and red-osier dogwood, will decrease in abundance with increasing shade by the overstory grand fir and Engelmann spruce canopy. Moderate to severe fires will generally kill the grand fir and Engelmann spruce seedlings, saplings and mature trees, and generally leave mature Ponderosa pine trees on the site. All of the common shrubs characteristic of this association will resprout from root crowns and/or rhizomes following fires and persist over time.

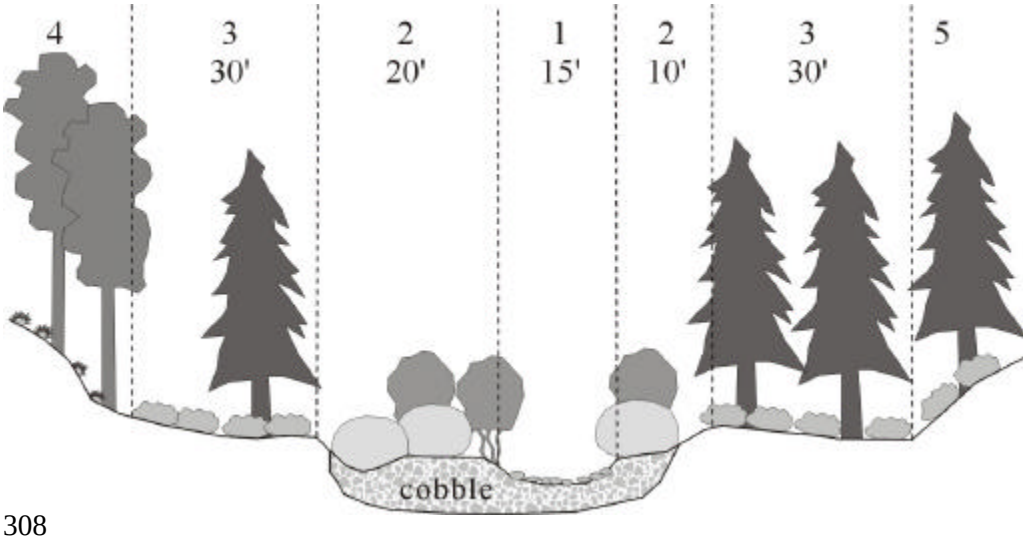
Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Grand fir (*Abies grandis*)	60	10	7-12
Engelmann spruce (*Picea engelmannii*)	40	30	10-50
Ponderosa pine (*Pinus ponderosa*)	40	24	18-30
TREE OVERSTORY-SUBDOMINANTS			
Grand fir (*Abies grandis*)	40	14	7-20
Engelmann spruce (*Picea engelmannii*)	40	12	8-15
TREE UNDERSTORY			
Grand fir (*Abies grandis*)	100	15	1-35
Engelmann spruce (*Picea engelmannii*)	40	5	--
Douglas fir (*Pseudotsuga menziesii*)	40	tr	--
SHRUBS			
Common snowberry (*Symphoricarpos albus*)	100	46	10-75
Prickly currant (*Ribes lacustre*)	80	4	tr-8
Rocky Mountain maple (*Acer glabrum*)	80	2	tr-3
Western serviceberry (*Amelanchior alnifolia*)	60	15	1-40
Red-osier dogwood (*Cornus sericea*)	60	6	1-15
Birchleaf spiraea (*Spiraea betulifolia*)	60	1	tr-1
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	80	4	1-10
Western fescue (*Festuca occidentalis*)	60	5	2-10
PERENNIAL FORBS			
Heart-leaf arnica (*Arnica cordata*)	60	6	tr-17
Enchanter's nightshade (*Circaea alpina*)	60	4	--
Yarrow (*Achillea millefolium*)	60	2	tr-6
Pathfinder (*Adenocaulon bicolor*)	60	2	tr-2
Starry Solomon seal (*Smilacina stellata*)	60	1	tr-2
Woods strawberry (*Fragaria vesca*)	60	1	tr-1

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997; Topik *et al.* 1988: 79
Washington: Kovalchik 2001

Illustrations

1 B3 stream reach
2 **Mountain alder-red-osier dogwood**, floodplain
3 Grand fir/common snowberry, terrace
4 Ponderosa pine/buchgrass, SW-facing sideslope
5 Grand fir/common snowberry, NE-facing sideslope



Elk Creek, Baker RD, Wallowa-Whitman NF; high gradient, mod. elevation, trough-shaped valley; Blue Mountains Ecoregion

Pseudotsuga menziesii/Acer glabrum-Physocarpus malvaceus Association

Douglas fir/Rocky Mountain maple-Mallow ninebark Association
8 plots. New type

Ecoregional Range
BM, EC

Environment and Soils

This Douglas fir plant association was sampled in the northern portions of the Blue and Wallowa Mountains as well as in the southwestern part of the East Cascades Ecoregion. It is found on streambanks, floodplains, and terraces. Valleys are moderately high to very high gradient, narrow to very narrow and V-shaped with moderately steep to steep sideslopes. Most valley aspects are east and south. Soils are composed of 0.5-1 m of silt and sandy loam over gravels, cobbles, and stones. The water table generally resides in the coarse alluvium at depths of 0.5-1 m. Rosgen stream types identified were A2a, A3 A5, C3 and C4 streams. Stream widths are narrow ranging from 1.5 to 5 m.

Vegetation Composition

Stands are characterized by a Douglas-fir overstory with a diverse tall shrub layer. Rocky Mountain maple, mallow ninebark, Lewis' mock-orange, oceanspray, and western serviceberry dominate this layer. The shrub understory, composed of snowberry, birch-leaf spiraea, bald-hip rose, Nootka rose, prickly currant, or western thimbleberry, is conspicuous. In the herbaceous layer, starry false-Solomon's seal, woods strawberry, mountain sweet-cicely, feathery Solomonplume, red columbine and western meadowrue are common. Sweet-scented bedstraw and heartleaf arnica are regular and occasionally abundant understory members. Frequently occurring grasses and sedges include blue wildrye and elk sedge. Height of the shrub overstory averages 6.6 m, and height of the shrub understory ranges from 1.8 m. The herbaceous layer averages 28cm. Herbaceous biomass averages 517 lbs/acre, ranging from 165 to 1100 lbs/acre.

Valley Environment	Average	Range
Elevation (ft)	3755	2380-4900
Plot Slope (%)	11	4-29
Valley Width (m)	14	5-20
Valley Gradient (%)	7	2-10
Valley Sideslopes (%)	52	45-70
Local Climate		
Mean Annual Precipitation (in.)	24	16-44
Mean Annual Snowfall (in.)	65	24-151
Mean Annual Temperature (F)	45	42-49
Mean Minimum Temperature (F)	33	29-37
Mean Maximum Temperature (F)	56	53-60
Median Date of Last Spring Freeze	June 6	May 18-June 25
Median Date of First Fall Freeze	Sep. 15	Aug 29-Sep 26
Soil Characteristics		
Depth to 30% Coarse Fragments (cm)	32	0-61
Rooting Depth (cm)	23	10-38
Soil Surface Cover (%)		
Submerged	2	0-10
Bare Ground	1	0-5
Gravel	tr	0-2
Rock	3	0-7
Moss	25	2-72
Lichen	1	0-8
Litter	67	13-98

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Douglas fir (*Pseudotsuga menziesii*)	75	28	5-70
Ponderosa pine (*Pinus ponderosa*)	25	8	5-10
TREE OVERSTORY-SUBDOMINANTS			
Douglas fir (*Pseudotsuga menziesii*)	50	2	2-15
TREE UNDERSTORY			
Douglas fir (*Pseudotsuga menziesii*)	75	3	tr-8
Grand fir (*Abies grandis*)	50	tr	tr-1
SHRUBS			
Rocky Mountain maple (*Acer glabrum*)	100	21	2-70
Mallow ninebark (*Physocarpus malvaceus*)	88	20	2-50
Common snowberry (*Symphoricarpos albus*)	100	16	tr-50
Birchleaf spiraea (*Spiraea betulifolia*)	88	3	tr-8
Western serviceberry (*Amelanchior alnifolia*)	75	3	tr-6
Oceanspray (*Holodiscus discolor*)	50	19	tr-40
Prickly currant (*Ribes lacustre*)	50	2	1-3
Thimbleberry (*Rubus parviflorus*)	38	13	2-30
Lewis' mockorange (*Philadelphus lewisii*)	38	7	8-10
Baldhip rose (*Rosa gymnocarpa*)	38	3	2-4
Nootka rose (*Rosa nutkana*)	38	2	2-3
SEDGES and RUSHES			
Geyer's sedge (*Carex geyeri*)	75	6	tr-15
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	50	17	tr-50
Blue wildrye (*Elymus glaucus*)	38	8	2-11
PERENNIAL FORBS			
Woods strawberry (*Fragaria vesca*)	88	1	tr-4
Starry false Solomon's seal (*Smilacina stellata*)	75	4	tr-8
Mountain sweet cicily (*Osmorhiza chilensis*)	75	2	tr-5
Sweet-scented bedstraw (*Galium trifolium*)	75	1	tr-3
Heart-leaf arnica (*Arnica cordata*)	63	10	tr-40
Western meadowrue (*Thalictrum alpinum*)	63	9	tr-35
Feathery Solomonplume (*Smilacina racemosa*)	63	1	tr-3
Red columbine (*Aquilegia formosa*)	63	tr	tr-1
FERNS and HORSETAILS			
Brittle bladderfern (*Cystopteris fragilis*)	63	tr	tr-2

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are: sideslopes - Douglas-fir/mallow ninebark, Douglas-fir/oceanspray, Douglas-fir/common snowberry, Idaho fescue-Bluebunch wheatgrass, and grand fir/Rocky Mountain maple.

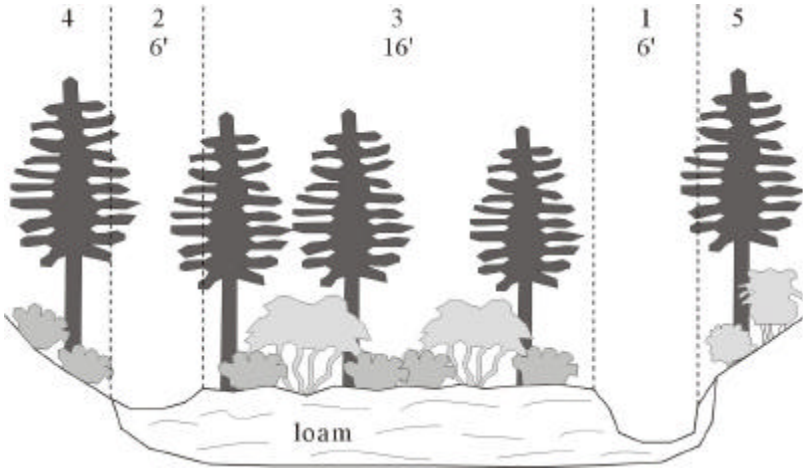
Successional Dynamics

Some sites may be seral to the Grand fir/Rocky Mountain maple Association. The presence of abundant, successfully regenerating grand fir seedlings on the site is a probably indicator of future succession toward the Grand fir/Rocky Mountain maple Association. Also, if more moisture-loving shrubs such as baldhip rose, big huckleberry, prickly currant, stinking swamp currant, Sitka alder (*Alnus viridus* spp. *sinuata*), thimbleberry, and bearberry honeysuckle (*Lonicera involucrata*) are in greater abundance than the more xeric shrubs, such as mallow ninebark, birchleaf spiraea, Nootka rose and Wood's rose (*Rosa woodsii*), the site may be likely to succeed to the higher moisture grand fir association. All of the above shrubs are fire-resistant and will resprout following all but the severest fire events. Bark beetles and insect defoliators may impact overstory trees stressed by recurrent drought.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997
Idaho: Jankovsky-Jones *et al.* 2001

Illustrations

1 A5 stream reach
2 overflow channel
3 **Douglas-fir/Rocky Mtn. maple-mallow ninebark**, terrace
4 Douglas-fir/mallow ninebark, southwest-facing sideslope
5 Douglas-fir/oceanspray (grand fir/big huckleberry potential), northeast facing- sideslope



Dry Fork Lick Creek, Pomeroy RD, Umatilla NF; high gradient, moderate-low elevation, V-shaped valley; Blue Mountains Ecoregion

*Pseudotsuga menziesii/Holodiscus discolor Association**

Douglas fir/Oceanspray Association
2 plots. CEGL000437

Ecoregional Range
BM, EC, WC

Environment and Soils

This association was sampled only twice although it is a common upland associations. Riparian geomorphic surfaces on which it occurs are terraces that are very infrequently (if ever) flooded. Valleys are south to southwest-facing, narrow, steep to very steep and V-shaped with gentle sideslopes. Valleys are south-facing. Water tables depth are probably well below the rooting zone throughout the growing season.

Valley Environment	Average	Range
Elevation (ft)	3845	3440-4250
Plot Slope (%)	30	9-50
Valley Width (m)	20	--
Valley Gradient (%)	28	5-50
Valley Sideslopes (%)	15	--
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	3	tr-5
Gravel	tr	tr-0
Rock	tr	tr-1
Cryptogam	10	0-20
Litter	84	73-95

Vegetation Composition

Douglas fir is the dominant overstory conifer and can be either dense or scattered. The shrub overstory (averaging 3 m in height) is dominated by oceanspray, and the shrub understory (averaging 1 m in height) is dominated by a common snowberry with occasional scattered birchleaf spiraea, prickly currant, Wood's rose and baldhip rose. The herbaceous layer (averaging 31 cm in height) is dominated by graminoids, generally either elk sedge or pinegrass, with scattered grasses and forbs at low cover such as blue wildrye, Canada violet, sweet-scented bedstraw, starry false-Solomon's seal and waterberry fairy-bells.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Douglas fir (*Pseudotsuga menziesii*)	50	100	--
TREE OVERSTORY-SUBDOMINANTS			
Douglas fir (*Pseudotsuga menziesii*)	50	10	--
Ponderosa pine (*Pinus ponderosa*)	50	5	--
White fir (*Abies concolor*)	50	5	--
TREE UNDERSTORY			
Douglas fir (*Pseudotsuga menziesii*)	50	1	--
White fir (*Abies concolor*)	50	1	--
Western juniper (*Juniperus occidentalis*)	50	1	--
SHRUBS			
Oceanspray (*Holodiscus discolor*)	100	30	20-40
Common snowberry (*Symphoricarpos albus*)	100	30	10-50
Birchleaf spiraea (*Spiraea betulifolia*)	50	5	--
Western serviceberry (*Amelanchior alnifolia*)	50	5	--
Prickly currant (*Ribes lacustre*)	50	5	--
SEDGES and RUSHES			
Geyer's sedge (*Carex geyeri*)	50	20	--
PERENNIAL GRASSES			
Western fescue (*Festuca occidentalis*)	100	3	tr-5
Pinegrass (*Calamagrostis rubescens*)	50	25	--
PERENNIAL FORBS			
Heart-leaf arnica (*Arnica cordata*)	100	tr	tr-1
American vetch (*Vicia americana*)	100	tr	tr-1
Sweet-scented bedstraw (*Galium trifolium*)	50	5	--
Starry false Solomon's seal (*Smilacina stellata*)	50	5	--
Waterberry fairy-bells (*Disporum trachycarpum*)	50	5	--
Canadian white violet (*Viola canadensis*)	50	5	--
Sweetroots (*Osmorhiza* spp.)	50	5	--

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
terraces – Douglas fir/common snowberry;
sideslopes – Douglas fir/common snowberry; ponderosa pine associations.

Successional Dynamics
This association is not expected to succeed to another unless there is an abundance of white fir or grand fir seedlings found on the site. Moderate to high intensity fires will kill Douglas fir but not the associated shrubs, which will resprout vigorously from root crowns following fires.

Other Studies Documenting Association with Plot Data
Oregon: Clausnitzer 1992: 85; Dryness *et al.* 1974: 13; Hemstrom *et al.* 1987: 62, 66, 70; Topik 1988: 59.

Pseudotsuga menziesii/Betula occidentalis Association

Douglas fir/Water birch Association
5 plots. CEGL002639.

Ecoregional Range
BM, CB?, EC?

Environment and Soils
Sites with the Douglas fir/Water birch Association were sampled only in the Blue Mountains Ecoregion but this association may also occur in the Columbia Basin Ecoregion and northern part of the East Cascades Ecoregion. Valleys are north and east-facing, moderately steep, narrow to wide and V-, trough- and flat-shaped with moderately steep to steep sideslopes. Most valley aspects are east- and southeast-facing. Rosgen stream types are C2 and C3. Soils are skeletal in subsoil horizons. Data are available for only two sites and show the average depth to 20-30% coarse fragments is 11 cm and to 23-35% coarse fragments is 38 cm.

Valley Environment	Average	Range
Elevation (ft)	2932	2660-3370
Plot Slope (%)	3	0-5
Valley Width (m)	88	20-200
Valley Gradient (%)	3	2-5
Valley Sideslopes (%)	51	45-70
Local Climate		
Mean Annual Precipitation (in.)	21	14-30
Mean Annual Snowfall (in.)	60	31-95
Mean Annual Temperature (F)	45	44-46
Mean Minimum Temperature (F)	33	31-36
Mean Maximum Temperature (F)	58	57-60
Median Date of Last Spring Freeze	June 7	May 23-June 19
Median Date of First Fall Freeze	Sep. 16	Sep. 9-Sep. 24
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	tr	0-1
Gravel	-	-
Rock	2	0-5
Cryptogam	22	1-60
Litter	75	35-99

Vegetation Composition
Douglas fir forms a low to moderately dense tree canopy with Ponderosa pine occasionally co-dominant. All sites have abundant water birch in the tallest shrub layer, scattered Lewis' mockorange in the shrub middle layer and dense common snowberry in the shrub understory. Sites have high litter cover and, in two locations, high cryptogam cover. Other middle layer shrubs include western serviceberry, oceanspray, Rocky Mountain maple and black hawthorn. Occasional understory shrubs include, thimbleberry, red-osier dogwood, baldhip rose and birchleaf spiraea. The herbaceous layer comprises a variety of graminoids and forbs, such as elk sedge, blue wildrye, Kentucky bluegrass, sweet-scented bedstraw, feathery Solomonplume, heartleaf arnice, Wood's strawberry, common scouring rush and mountain sweet-cicily. The shrub overstory height averages 4.8 m, and the shrub understory height averages 1.2 m (ranging from 0.6-1.8m). Height of the herbaceous layer averages 25 cm. Biomass averages 376 lbs/acre (ranging from 33 to 840 lbs/acre).

Adjacent Vegetation
Riparian and upland vegetation types adjacent to sites sampled are:
terraces – Douglas fir/Rocky Mountain maple-Mallow ninebark;
sideslopes – Douglas fir/Common snowberry; Ponderosa pine associations; Idaho fescue-Bluebunch wheatgrass; and Western juniper associations

Successional Dynamics
This association may be a seral stage between the Water birch/Lewis' mockorange Association, which occurs on more undeveloped alluvial soils and other Douglas fir/shrub associations. Moderate to high intensity fires will kill Douglas fir but not the associated shrubs, which will resprout vigorously from root crowns following fires.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Douglas fir (*Pseudotsuga menziesii*)	80	26	10-50
Ponderosa pine (*Pinus ponderosa*)	60	10	3-20
TREE OVERSTORY-SUBDOMINANTS			
Douglas fir (*Pseudotsuga menziesii*)	80	9	2-12
Ponderosa pine (*Pinus ponderosa*)	40	5	tr-10
TREE UNDERSTORY			
Douglas fir (*Pseudotsuga menziesii*)	80	2	1-3
Ponderosa pine (*Pinus ponderosa*)	40	1	--
SHRUBS			
Common snowberry (*Symphoricarpos albus*)	100	69	37-90
Water birch (*Betula occidentalis*)	100	29	10-75
Lewis' mockorange (*Philadelphus lewisii*)	100	9	tr-15
Western serviceberry (*Amelanchior alnifolia*)	80	11	5-25
Rocky Mountain maple (*Acer glabrum*)	60	12	2-25
Creeping Oregon grape (*Berberis repens*)	60	3	1-5
Thimbleberry (*Rubus parviflorus*)	40	35	10-60
Oceanspray (*Holodiscus discolor*)	40	21	11-30
PERENNIAL GRASSES			
Western fescue (*Festuca occidentalis*)	80	6	2-10
Blue wildrye (*Elymus glaucus*)	80	2	1-5
Kentucky bluegrass (*Poa pratensis*)	40	40	5-75
PERENNIAL FORBS			
Sweet-scented bedstraw (*Galium trifolium*)	80	7	tr-25
Feathery Solomonplume (*Smilacina racemosa*)	60	1	tr-1
Heart-leaf arnica (*Arnica cordata*)	40	38	tr-75
Mountain sweet cicily (*Osmorhiza chilensis*)	40	4	2-5
Woods strawberry (*Fragaria vesca*)	40	4	2-5
FERNS and HORSETAILS			
Common scouring Rush (*Equisetum hyemale*)	60	2	tr-5

Other Studies Documenting Association with Plot Data
Nevada: Manning and Padgett (1995) describe a Conifer/Betula occidentalis Community Type that includes *Pseudotsuga menziesii/Betula occidentalis* stands.
Colorado: Kittel *et al.* 1999

Pseudotsuga menziesii/Crataegus douglasii-Symphoricarpos albus Association

Douglas fir/Black hawthorn-Common snowberry Association
4 plots. New type

Valley Environment	Average	Range
Elevation (ft)	3280	2640-3800
Plot Slope (%)	3	tr-10
Valley Width (m)	30	5-65
Valley Gradient (%)	4	1-10
Valley Sideslopes (%)	43	15-70
Local Climate		
Mean Annual Precipitation (in.)	23	16-31
Mean Annual Snowfall (in.)	59	35-77
Mean Annual Temperature (F)	45	43-46
Mean Minimum Temperature (F)	33	30-35
Mean Maximum Temperature (F)	57	54-60
Median Date of Last Spring Freeze	June 10	May 29-July 4
Median Date of First Fall Freeze	Sep. 14	Aug. 26-Sep. 23
Soil Characteristics		
Depth to 30% Coarse Fragments (cm)	34	20-48
Soil Surface Cover (%)		
Submerged	3	0-10
Bare Ground	tr	0-3
Gravel	-	-
Rock	1	0-5
Cryptogam	24	0-65
Litter	72	22-100

Ecoregional Range
BM, EC?

Environment and Soils
Sites with the Douglas fir/Black hawthorn-common snowberry Association were sampled at moderately low elevations in the Blue Mountains Ecoregion, but it may also occur in the northern part of the East Cascades Ecoregion. Sites are floodplains and terraces. Valleys are south, southwest and west-facing, very narrow to moderately wide, low to high gradient, and V- and trough-shaped. Sideslopes are gentle to steep. Associated Rosgen stream types are B3, B4 and C3.

This association differs from the Douglas fir/Black hawthorn-common snowberry Association in having more precipitation and a longer frost-free period.

Vegetation Composition
Douglas fir dominates the conifer overstory with Ponderosa pine as an occasional co-dominant. Grand fir seedlings are sometimes scattered at low cover. Black hawthorn is the dominant overstory shrub on most sites. Other sparse to occasionally abundant overstory shrubs include western serviceberry, Lewis' mockorange, mallow ninebark, oceanspray and cascara. Common snowberry dominates the shrub understory with scattered birchleaf spiraea, Wood's rose, prickly currant or thimbleberry on some sites. The herbaceous layer is generally sparse and species occur at low cover. Litter is abundant on all sites with occasionally abundant cryptogams. Average height of shrub overstory is 3.5m (ranging from 2.5 to 4.6 m). Average height of shrub understory is 1.4m, ranging from 0.9-1.8m. Average height of herbaceous layer is 51cm, ranging from 20-81 cm. Average biomass is 204 lbs/acre, ranging from 17-533 lbs/acre.

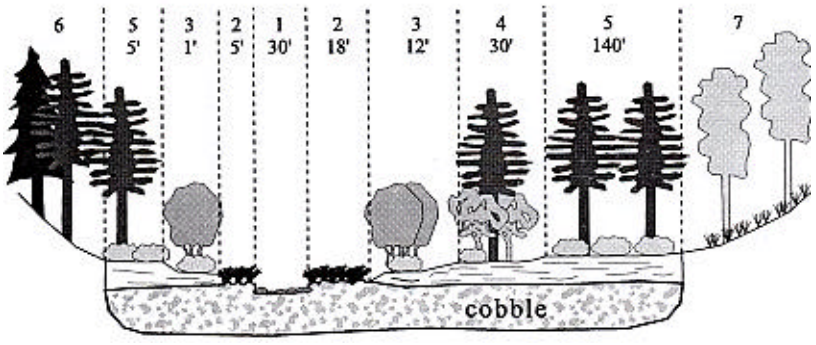
Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
sideslopes – Douglas fir/Common snowberry, Douglas fir/Birchleaf spiraea dry grand fir associations, Ponderosa pine associations

Successional Dynamics
This association may occasionally be successional from the Douglas fir/Water birch Association , developing as sites become drier and more horizontally and/or vertically removed from the valley bottom water table. If overstory shade from conifers greatly increases, black hawthorn cover may decrease in the stand and the vegetation may resemble the Douglas fir/Common snowberry Association. Moderate to high intensity fires will kill Douglas fir but not the associated shrubs, which will resprout vigorously from root crowns following fires.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer (1997) describe a *Pseudotsuga menziesii/Symphoricarpos albus* Association that includes Pseudotsuga *menziesii/Crataegus douglasii-Symphoricarpos albus* stands.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Douglas fir (*Pseudotsuga menziesii*)	100	21	5-40
TREE OVERSTORY-SUBDOMINANTS			
Ponderosa pine (*Pinus ponderosa*)	50	6	4-7
Douglas fir (*Pseudotsuga menziesii*)	50	5	tr-10
TREE UNDERSTORY			
Grand fir (*Abies grandis*)	50	3	2-3
Douglas fir (*Pseudotsuga menziesii*)	50	1	tr-2
SHRUBS			
Black hawthorn (*Crataegus douglasii*)	100	49	20-70
Common snowberry (*Symphoricarpos albus*)	100	13	10-15
Baldhip rose (*Rosa gymnocarpa*)	75	4	tr-12
Western serviceberry (*Amelanchior alnifolia*)	75	4	1-8
Lewis' mockorange (*Philadelphus lewisii*)	50	13	1-25
Birchleaf spiraea (*Spiraea betulifolia*)	50	8	5-10
SEDGES and RUSHES			
Geyer's sedge (*Carex geyeri*)	75	2	tr-5
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	50	4	2-5
PERENNIAL FORBS			
Feathery Solomonplume (*Smilacina racemosa*)	75	1	tr-3
Woods strawberry (*Fragaria vesca*)	75	1	tr-2
Sweet-scented bedstraw (*Galium trifolium*)	50	3	1-5
Mountain sweet cicily (*Osmorhiza chilensis*)	50	3	1-4
Starry false Solomon's seal (*Smilacina stellata*)	50	2	tr-4
Waterberry fairy-bells (*Disporum trachycarpum*)	50	2	tr-3

Illustrations
1 C3/B3 stream reach
2 **Torrent sedge**, channel shelf
3 **Mountain alder/common snowberry**, floodplain
4 **Douglas -fir/black hawthorn-common snowberry**, inactive floodplain
5 **Douglas-fir/common snowberry**, terrace
6 Grand fir-Douglas-fir, north-facing sideslope
7 Ponderosa pine/elk sedge, south-facing sideslope



Middle Fork John Day River, Long Creek RD, Malheur NF; very low gradient, mod. low elevation, flat-shaped valley; Blue Mountains Ecoregion

Pseudotsuga menziesii/Symphoricarpos albus Association

Douglas fir/Common snowberry Association
7 plots. CEGL000458

Ecoregional Range
BM, CB, EC, WC

Environment and Soils

The Douglas-fir/Common Snowberry Association was found at low to moderate elevations in the central Blue Mountains Ecoregion and the northern East Cascades Ecoregion. Fluvial geomorphic surfaces are terraces and high floodplains located in moderate to high gradient north and east-facing valley. Associated Rosgen stream reach types are B3, C2, C3, or F4. Soils generally consist of fine textured silt loam and loam over sandy loam, coarse sands, gravels, and cobbles. This association differs from the Douglas fir/Black hawthorn-common snowberry Association in having less precipitation and a shorter frost-free period.

Valley Environment	Average	Range
Elevation (ft)	3689	1960-4460
Plot Slope (%)	3	0-10
Valley Width (m)	110	20-200
Valley Gradient (%)	4	2-10
Valley Sideslopes (%)	45	--
Local Climate		
Mean Annual Precipitation (in.)	19	16-23
Mean Annual Snowfall (in.)	53	32-76
Mean Annual Temperature (F)	44	42-48
Mean Minimum Temperature (F)	32	29-37
Mean Maximum Temperature (F)	57	54-59
Median Date of Last Spring Freeze	June 21	May 22-July 6
Median Date of First Fall Freeze	Sep. 7	Aug. 25-Oct 2
Soil Surface Cover (%)		
Submerged	49	0-98
Bare Ground	4	0-15
Gravel	2	0-5
Rock	4	0-15
Cryptogam	7	0-15
Litter	67	2-95

Vegetation Composition

This floodplain association is dominated by Douglas-fir in the overstory. Seral tree species such as ponderosa pine or white fir are important overstory components in successional stands. Common snowberry is the most abundant shrub species under late-seral or climax conditions. Wood's rose, western serviceberry and occasionally red-osier dogwood, Scouler's willow and oceanspray are scattered at low cover in the shrub layer. Oregon grape is an important dwarf shrub. The herbaceous layer most commonly comprises elk sedge, Kentucky bluegrass, blue wildrye, heartleaf arnice, Menzie's silene and yarrow. Average height of the shrub overstory is 2.5 m, and average height of the shrub understory is 1 m. Average height of the herbaceous layer is 51 cm.

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are:
terraces – Douglas fir associations, grand fir/Pinegrass (*Calamagrostis rubescens*) ;
sideslopes - grand fir/pinegrass, grand fir/Big huckleberry (*Vaccinium membranaceum*), Douglas-fir/Geyer's sedge (*Carex geyeri*), Douglas-fir/common snowberry, ponderosa pine/elk sedge and other Ponderosa pine associations

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997: 66; Hemstrom *et al.* 1987: 74; Ganskopp 1979: 73, 93; Topik 1988: 67.
Washington: Kovalchik 2001

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Douglas fir (*Pseudotsuga menziesii*)	100	30	20-45
TREE OVERSTORY-SUBDOMINANTS			
Ponderosa pine (*Pinus ponderosa*)	57	12	8-15
White fir (*Abies concolor*)	43	8	5-15
Douglas fir (*Pseudotsuga menziesii*)	14	5	--
TREE UNDERSTORY			
Douglas fir (*Pseudotsuga menziesii*)	71	2	2-3
White fir (*Abies concolor*)	43	4	1-10
Ponderosa pine (*Pinus ponderosa*)	43	1	--
SHRUBS			
Common snowberry (*Symphoricarpos albus*)	100	29	5-80
Creeping Oregon grape (*Berberis repens*)	86	3	tr-10
Wood's rose (*Rosa woodsii*)	71	4	1-10
Western serviceberry (*Amelanchior alnifolia*)	71	3	tr-10
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	57	16	2-50
Blue wildrye (*Elymus glaucus*)	57	4	tr-5
PERENNIAL FORBS			
Heart-leaf arnica (*Arnica cordata*)	57	3	tr-5
Yarrow (*Achillea millefolium*)	57	2	tr-4
Menzie's silene (*Silene menziesii*)	57	2	tr-5
Woods strawberry (*Fragaria vesca*)	43	4	tr-5
Northern bedstraw (*Galium boreale*)	43	3	tr-5
Broadpetal strawberry (*Fragaria virginiana*)	43	3	tr-5
Red columbine (*Aquilegia formosa*)	43	3	tr-5
Waterberry fairy-bells (*Disporum trachycarpum*)	43	3	tr-5
Feathery Solomonplume (*Smilacina racemosa*)	43	2	tr-5

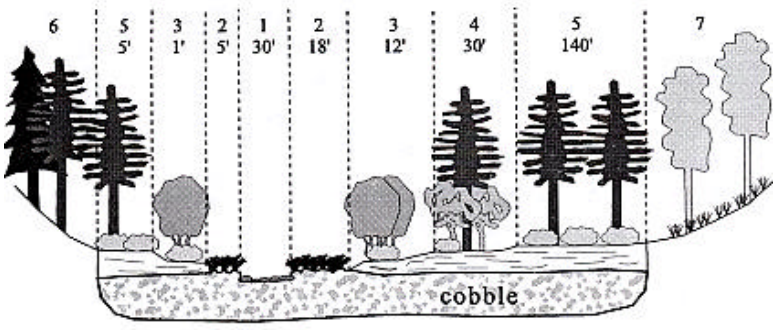
Successional Dynamics

This association may occasionally be successional from the Douglas fir/Water birch Association , developing as sites become drier and more horizontally and/or vertically removed from the valley bottom water table. An abundance of healthy white fir seedlings and overstory trees may indicate potential successional to a white fir/common snowberry association (not sampled or described in this classification). Moderate to high intensity fires will kill Douglas fir but not the associated shrubs, which will resprout vigorously from root crowns following fires. Insects and disease may impact overstory trees stressed by recurrent drought.

Overuse by grazing animals will lead to reduction of snowberry abundance and an increase in Kentucky bluegrass. Some overgrazed sites are characterized by abundant western blue flag.

Illustrations

1. C3/B3 stream reach
2. **Torrent sedge**, channel shelf
3. **Mountain alder/common snowberry**
4. **Douglas -fir/Black hawthorn-snowberry**, inactive floodplain
5. **Douglas-fir/snowberry**, terrace
6. Grand fir-Douglas-fir, north facing sideslope
7. Ponderosa pine/elk sedge, south facing sideslope



Middle Fork John Day River, Malheur NF; very low gradient, mod. low elevation, flat-shaped valley

*Pseudotsuga menziesii/Pteridium aquilinum Association**

Douglas fir/Brackenfern Association
1 plot. New type

Ecoregional Range
BM?, EC

Environment and Soils
One site in this association was sampled at 4900 ft. elevation in a narrow valley with a 2% gradient and moderately steep sideslopes. The site had 85% litter cover, 10% cryptogam cover, 5% rock cover and trace cover or bare ground and gravel.

Vegetation Composition
Douglas fir forms a dense canopy over abundant bracken fern cover and scattered shrubs and forbs, such as twinflower, western serviceberry, Rocky Mountain maple, pathfinder and starry false-Solomon's seal.

Dominant Species	Canopy Cover (%)
TREE OVERSTORY-DOMINANTS	
Douglas fir (*Pseudotsuga menziesii*)	40
TREE OVERSTORY-SUBDOMINANTS	
White fir (*Abies concolor*)	3
TREE UNDERSTORY	
Douglas fir (*Pseudotsuga menziesii*)	8
White fir (*Abies concolor*)	tr
SHRUBS	
Twinflower (*Linnaea borealis*)	8
Western serviceberry (*Amelanchior alnifolia*)	3
Rocky Mountain maple (*Acer glabrum*)	3
PERENNIAL GRASSES	
Columbia brome (*Bromus vulgaris*)	3
PERENNIAL FORBS	
Pathfinder (*Adenocaulon bicolor*)	8
Starry false Solomon's seal (*Smilacina stellata*)	8
Broadleaf starflower (*Trientalis latifolia*)	3
Canadian white violet (*Viola canadensis*)	3
FERNS and HORSETAILS	
Brackenfern (*Pteridium aquilinum*)	20

Adjacent Vegetation
Upland vegetation adjacent to this sample site is white fir-Douglas fir forest.

Successional Dynamics
This association is probably successional to or a disclimax of the White fir/Twinflower Association.

Other Studies Documenting Association with Plot Data
none

*Pseudotsuga menziesii/Trautvetteria caroliniensis Association**

Douglas fir/False bugbane Association
2 plots. New type

Ecoregional Range
BM

Environment and Soils

These two plots were sampled on the Wallowa Valley Ranger District north of the Wallowa Valley in northeast Oregon. This association may be isolated to the northern Blue Mountains where there is a large population of false bugbane. Geomorphic surfaces on which this association was sampled are floodplains. Valleys are southwest-facing, moderate gradient, very narrow to narrow and V- or trough-shaped with moderately steep sideslopes. Associated Rosgen stream types are C3. Soils are composed of fine-textured fairly shallow surface horizons over coarse-fragment-rich subsurface horizons.

Valley Environment	Average	Range
Elevation (ft)	4610	4340-4880
Plot Slope (%)	8	5-10
Valley Width (m)	13	5-20
Valley Gradient (%)	4	2-5
Valley Sideslopes (%)	45	--
Soil Characteristics		
Thickness of Epipedon (cm)	16	14-18
Rooting Depth (cm)	26	25-26
Depth to 20% Coarse Fragments (cm)	31	26-35
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	6	2-10
Gravel	tr	0-5
Rock	1.5	0-3
Cryptogam	16	2-30
Litter	76	57-95

Vegetation Composition

Douglas fir is the sole overstory or understory conifer dominant. A variety of shrubs occur at low to moderate cover, including mallow ninebark, common snowberry, baldhip rose, prickly currant, Wolf currant and Idaho gooseberry. False bugbane carpets sites in the herbaceous layer. A wide variety of forbs and graminoids are scattered through sites, the most abundant being Columbia monkshood, mountain sweet-cicily, heartleaf arnica, Canada violet and American speedwell. The shrub layer averages 1.1 m in height, ranging from 0.9-1.2m. The herbaceous layer averages 55cm, ranging from 31 to 79 cm. Herbaceous biomass from one sample site was 1313 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Douglas fir (*Pseudotsuga menziesii*)	50	8	--
TREE OVERSTORY-SUBDOMINANTS			
Douglas fir (*Pseudotsuga menziesii*)	50	8	--
TREE UNDERSTORY			
Grand fir (*Abies grandis*)	100	tr	--
Douglas fir (*Pseudotsuga menziesii*)	50	20	--
SHRUBS			
Common snowberry (*Symphoricarpos albus*)	100	3	2-4
Baldhip rose (*Rosa gymnocarpa*)	100	3	2-3
Mallow ninebark (*Physocarpus malvaceus*)	50	30	--
Idaho gooseberry (*Ribes irriguum*)	50	10	--
PERENNIAL GRASSES			
Columbia brome (*Bromus vulgaris*)	50	7	--
Western fescue (*Festuca occidentalis*)	50	7	--
Alaska oniongrass (*Melica subulata*)	50	3	--
PERENNIAL FORBS			
False bugbane (*Trautvettaria caroliniensis*)	100	55	45-65
Columbia monkshood (*Aconitum columbianum*)	100	13	tr-25
Mountain sweet cicily (*Osmorhiza chilensis*)	100	9	2-15
Heart-leaf arnica (*Arnica cordata*)	100	4	3-4
American speedwell (*Veronica americana*)	100	3	2-4
Wood buttercup (*Ranunculus uncinatus*)	100	2	1-3
Western meadowrue (*Thalictrum alpinum*)	100	2	1-3

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
terraces – Ponderosa pine and Douglas fir associations.

Successional Dynamics
These plots are probably successional to Grand fir/False bugbane (*Trautvettaria caroliniensis*).

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997

Pinus ponderosa/Symphoricarpos albus Association

Ponderosa pine/Common snowberry Association
18 plots. CEGL000203

Ecoregional Range
BM, EC

Environment and Soils
The Ponderosa pine/Common snowberry Association is abundant at moderately low to moderate elevations throughout the southern and central Blue Mountains Ecoregion and the central East Cascades Ecoregion. It occurs occasionally in the southern East Cascades and the northern Blue Mountains Ecoregions. Geomorphic surfaces are inactive floodplains and terraces with well-aerated soils and moderate soil moisture. Valleys are generally low to moderate gradient, from very narrow to very wide, and are flat-, trough- or V-shaped. Valley sideslopes are generally gentle to moderately steep. Valley aspects are all but northeast-facing.

The texture of the surface horizon ranges from silt loam to coarse sandy loam to sandy clay loam. More recently water-worked soils may contain some cobbles and gravels in the surface horizon but usually these materials are located deeper at zones of past active streambeds. Available water holding capacity is moderate. Water tables are within 1 meter of the soil surface in May and June and lower to more than 1.5 m below the soil surface in July and August. Adjacent stream reaches are Rosgen B3, B4, B5, C3, C4, E3, and F4 types. Stream width varied from 1.5 to 6 m. This association differs from the Ponderosa pine/Black hawthorn-common snowberry Association in having lower annual precipitation and a shorter frost-free period.

Vegetation Composition
Stands representing this association are dominated by ponderosa pine in the overstory and common snowberry in the shrub layer. Other trees occur rarely; Douglas fir, white fir, grand fir, incense cedar, western larch, lodgepole pine and quaking aspen are scarce and western juniper is occasionally well represented. Wood's rose is often present at low to moderate cover. The herbaceous layer is generally dominated by Kentucky bluegrass, a naturalized Eurasian grass. On more mesic sites, the ground vegetation is typified by forbs such as feathery Solomon plume, sweet-scented bedstraw, Wood's strawberry, starry false Solomon's seal and common cowparsnip. On dry sites, elk sedge is well represented along with a dry forb layer typified by northern bedstraw, blue wildrye, western yarrow, sweet-cicilys (*Osmorhiza* spp.) and meadowrue. Height of the shrub overstory averages 2.1 m, ranging from 0.6-7.7 m. Height of the shrub understory averages 1.2 m, ranging from 0.9 to 1.5 m. The average height of herbaceous layer is 38 cm, ranging from 15 to 61 cm. Average herbaceous biomass is 3513 lbs/acre, ranging from 667 to 11611 lbs/acre.

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are: terraces – Douglas fir/common snowberry, Big sagebrush associations; sideslopes - ponderosa pine/big sagebrush/Idaho fescue-Bluebunch wheatgrass, ponderosa pine/common snowberry, ponderosa pine/Geyer's sedge, Douglas fir/common snowberry and Western juniper/big sagebrush.

Valley Environment	Average	Range
Elevation (ft)	4035	2440-5230
Plot Slope (%)	8	0-75
Valley Width (m)	71	5-350
Valley Gradient (%)	10	1-75
Valley Sideslopes (%)	36	15-45
Local Climate		
Mean Annual Precipitation (in.)	18	13-23
Mean Annual Snowfall (in.)	60	31-104
Mean Annual Temperature (F)	44	41-47
Mean Minimum Temperature (F)	31	28-35
Mean Maximum Temperature (F)	57	53-61
Median Date of Last Spring Freeze	June 26	June 9-July 10
Median Date of First Fall Freeze	Sep. 3	Aug. 19-Sep. 15
Soil Characteristics		
Rooting Depth (cm)	60	33-132
Current Water Table Depth (cm)	95	40-200
Depth to 80% Coarse Fragments (cm)	86	38-200+
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	2	0-12
Gravel	-	-
Rock	1	0-10
Cryptogam	2	0-10
Litter	90	20-100

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Ponderosa pine (*Pinus ponderosa*)	78	42	15-70
TREE OVERSTORY-SUBDOMINANTS			
Ponderosa pine (*Pinus ponderosa*)	33	16	5-40
TREE UNDERSTORY			
Ponderosa pine (*Pinus ponderosa*)	57	2	1-5
SHRUBS			
Common snowberry (*Symphoricarpos albus*)	100	38	2-95
Wood's rose (*Rosa woodsii*)	72	6	1-25
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	83	22	tr-70
Blue wildrye (*Elymus glaucus*)	56	5	tr-35
PERENNIAL FORBS			
Yarrow (*Achillea millefolium*)	72	4	tr-20
Feathery Solomonplume (*Smilacina racemosa*)	67	3	tr-7
Woods strawberry (*Fragaria vesca*)	61	6	tr-20
Northern bedstraw (*Galium boreale*)	61	3	tr-12

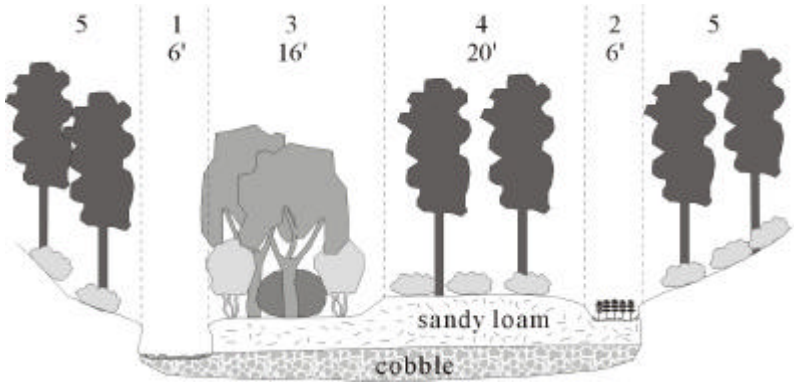
Successional Dynamics
With overuse by livestock, Kentucky bluegrass, other graminoids, and dry site forbs (see above) become co-dominant with common snowberry and eventually dominate the stand. Snowberry cover becomes clumpy because of its sensitivity to soil compaction. The coniferous overstory becomes moderately to poorly stocked as soil compaction and grazing prevents conifer regeneration. Continued overuse may lead to complete replacement of snowberry by Kentucky bluegrass and forbs

Mature Ponderosa pines can withstand low to moderate intensity fires that do not reach the tree crowns. Snowberry and Wood's rose will resprout from rhizomes following all but the highest intensity fires.

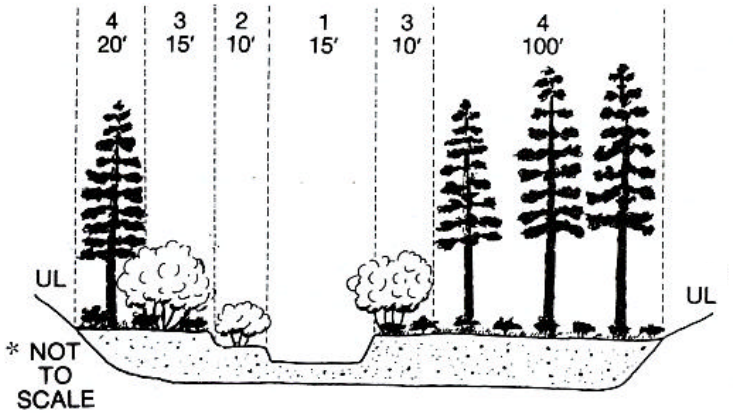
Other Studies Documenting Association with Plot Data
Oregon: Kovalchik 1987: 27; Crowe and Clausnitzer 1997: 72; Hall 1973: 30; Ganskopp 1979: 67, 95
Washington: Crawford (2001) describes a *Pinus ponderosa/Amelanchior alnifolia* Association that includes a stand of *Pinus ponderosa/Symphoricarpos albus*.

Illustrations

1 B3 stream reach
2 **Common horsetail**, overflow channel
3 **Black cottonwood/ mountain alder-red-osier dogwood**, floodplain
4 **Ponderosa pine/common snowberry**, inactive floodplain
5 **Ponderosa pine/common snowberry**, east- and west-facing sideslope



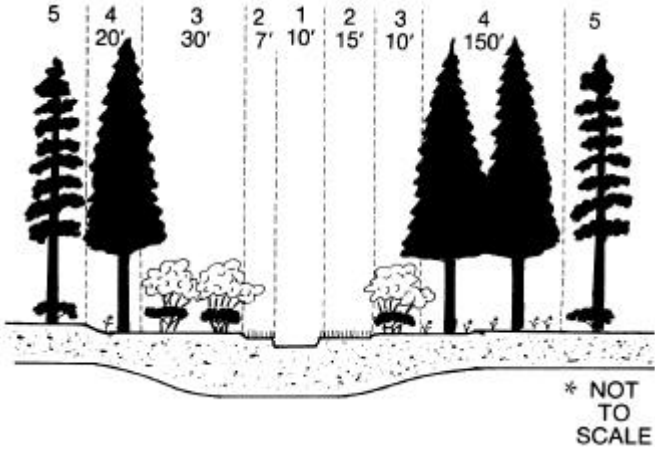
Cottonwood Creek, Malheur NF; mod. gradient, mod. elevation, V-shaped valley; Blue Mountains



1 Ochoco Creek, third order
2 **Mountain alder/common horsetail**, active channel shelf
3 **Mountain alder-common snowberry**, banks
4 **Ponderosa pine/common snowberry**, inactive floodplain

Ochoco Creek; mod gradient, low elevation floodplain; Blue Mountains Ecoregion

1 Lake Creek, third order
2 **Small-fruit bulrush**, active channel shelves
3 **Mountain alder-common snowberry**, active floodplains
4 **Grand fir-White fir/queencup beadlily,** inactive floodplains
5 **Ponderosa pine/common snowberry**, terraces



Lake Creek; mod-low gradient, low elevation floodplain; Blue Mountains Ecoregion

Pinus ponderosa/Crataegus douglasii-Symphoricarpos albus Association

Ponderosa pine/Black hawthorn-Common snowberry Association
3 plots. CEGL000855

Ecoregional Range
BM, CB?, EC?

Environment and Soils

The Ponderosa pine/Black hawthorn-common snowberry Association was sampled only in the central and eastern Blue Mountains Ecoregion but may also occur in the northern East Cascades Ecoregion and the Columbia Basin Ecoregion. Valleys are southwest- and northwest-facing, narrow to very wide, moderate gradient, V-, flat- and trough-shaped and have moderately steep to steep sideslopes. Adjacent Rosgen stream reach types are B3, C3 and F4. Soils have silt loam surface horizons approximately 55 cm deep over water-worked cobble and gravel. This association differs from the Ponderosa pine/Common snowberry Association in having higher annual precipitation and a longer frost-free period.

Valley Environment	Average	Range
Elevation (ft)	3513	2800-3910
Plot Slope (%)	1	tr-3
Valley Width (m)	190	20-350
Valley Gradient (%)	2	--
Valley Sideslopes (%)	53	45-70
Local Climate		
Mean Annual Precipitation (in.)	22	18-28
Mean Annual Snowfall (in.)	60	41-84
Mean Annual Temperature (F)	45	42-48
Mean Minimum Temperature (F)	31	29-36
Mean Maximum Temperature (F)	58	56-60
Median Date of Last Spring Freeze	June 17	May 26-July 5
Median Date of First Fall Freeze	Sep. 6	Aug. 26-Sep. 25
Soil Characteristics		
Depth to 80% Coarse Fragments (cm)	56	52-59
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	2	0-5
Gravel and Rock	-	-
Cryptogam	4	0-10
Litter	70	20-100

Vegetation Composition

Ponderosa pine comprises the tree canopy. Black hawthorn is a fairly dense shrub overstory and common snowberry forms a scattered to relatively abundant shrub understory. Other occasional shrubs are chokecherry, Idaho gooseberry and Lewis' mockorange. Height of the shrub overstory averages 4 m at an average height of 0.9 m. Herbaceous layer averages 31 cm in height. Herbaceous biomass averages 841 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Ponderosa pine (*Pinus ponderosa*)	100	40	10-85
TREE OVERSTORY-SUBDOMINANTS			
Ponderosa pine (*Pinus ponderosa*)	67	12	8-15
SHRUBS			
Black hawthorn (*Crataegus douglasii*)	100	75	45-90
Common snowberry (*Symphoricarpos albus*)	100	22	2-45
SEDGES and RUSHES			
Geyer's sedge (*Carex geyeri*)	67	23	20-25
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	67	50	30-70
Blue wildrye (*Elymus glaucus*)	67	11	1-20
PERENNIAL FORBS			
Starry false Solomon's seal (*Smilacina stellata*)	67	27	3-50
Northern bedstraw (*Galium boreale*)	67	10	4-15
Yarrow (*Achillea millefolium*)	67	8	tr-15

Adjacent Vegetation
sideslopes – Ponderosa pine and Douglas fir associations

Successional Dynamics
With overuse by livestock, Kentucky bluegrass, other graminoids, and dry site forbs (see above) become co-dominant with common snowberry and eventually dominate the stand. Snowberry cover becomes clumpy because of its sensitivity to soil compaction. The coniferous overstory becomes moderately to poorly stocked as soil compaction and grazing prevents conifer regeneration. Continued overuse may lead to complete replacement of snowberry by Kentucky bluegrass and forbs.

Mature Ponderosa pines can withstand low to moderate intensity fires that do not reach the tree crowns. Snowberry and black hawthorn will resprout from rhizomes following all but the highest intensity fires.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer (1997) described the *Pinus ponderosa/Symphoricarpos albus* Association, which includes sites in this association; Kauffman *et al.* 1985: 17
Washington: Crawford (2001) describes a *Pinus ponderosa/Amelanchior alnifolia* Association that includes a stand of *Pinus ponderosa/Crataegus douglasii-Symphoricarpos albus*

Populus balsamerifera ssp. trichocarpha – Alluvial Bar Association

Black cottonwood – Alluvial bar Association
11 plots. New type

Ecoregional Range
BM, BR, CB, EC

Valley Environment	Average	Range
Elevation (ft)	3210	760-6260
Plot Slope (%)	6	tr-30
Valley Width (m)	112	20-350
Valley Gradient (%)	4	1-10
Valley Sideslopes (%)	50	15-70
Local Climate		
Mean Annual Precipitation (in.)	26	11-62
Mean Annual Snowfall (in.)	91	12-406
Mean Annual Temperature (F)	46	35-532
Mean Minimum Temperature (F)	34	23-41
Mean Maximum Temperature (F)	58	46-65
Median Date of Last Spring Freeze	June 4	April 25-July 11
Median Date of First Fall Freeze	Sep. 18	Aug. 28-Oct. 12
Soil Surface Cover (%)		
Submerged	tr	0-5
Bare Ground	10	0-37
Gravel	1	0-5
Rock	39	0-70
Cryptogam	2	0-5
Litter	45	15-100

Environment and Soils
The Black cottonwood Alluvial bar Association is widespread through the ecoregions of central and eastern Oregon. The range of biophysical climates in which this association occurs varies widely as shown by the ranges in various local climate parameters (see adjacent table) as well as in wide range in associated upland vegetation types (see section below). Fluvial geomorphic sites are alluvial bars that are young deposits of cobble-rich sediment that are often frequently flooded in spring. Valleys are moderately to very wide, low to moderate (occasionally high) gradient, and U-, trough-, V- and flat-shaped with moderately steep to steep sideslopes. Most valleys are northeast, southeast or southwest facing. Two of the valleys are west-facing. Associated Rosgen stream types are A2, A3, C3, C4 and D3. Soils are extremely young Entisols or with no discernible development and site surfaces have high rock cover. This association receives more precipitation, much more annual snowfall and is cooler than the Black cottonwood-Alluvial bar Association.

Vegetation Composition

Vegetation in this type is composed primarily of an abundant black cottonwood seedlings and saplings or a black cottonwood tree layer. Shrubs that occur sporadically at low cover are MacKenzie's and shining willow, red-osier dogwood, mountain alder, Lewis' mockorange and common snowberry. Herbaceous cover is usually sparse, although individual species occasionally have high cover. Height of the shrub overstory averages 4.2 m, ranging from 3.7 m to 4.6 m.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Black cottonwood (*Populus balsamerifera* ssp. *trichocarpa*)	64	65	38-83
TREE OVERSTORY-SUBDOMINANTS			
Black cottonwood (*Populus balsamerifera* ssp. *trichocarpa*)	10	20	--
TREE UNDERSTORY			
Black cottonwood (*Populus balsamerifera* ssp. *trichocarpa*)	82	34	tr-65
SHRUBS			
Lewis' mockorange (*Philadelphus lewisii*)	36	18	tr-65
MacKenzie's willow (*Salix prolixa*)	27	3	1-8
Mountain alder (*Alnus incana*)	36	4	3-5
Common snowberry (*Symphoricarpos albus*)	27	1	tr-3
Shining willow (*Salix lucida*)	27	1	tr-3
Red-osier dogwood (*Cornus sericea*)	27	1	tr-2
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	46	4	tr-13
Blue wildrye (*Elymus glaucus*)	46	3	tr-13
PERENNIAL FORBS			
Prairie sage (*Artemisia ludoviciana*)	36	1	tr-3
Curly dock (*Rumex crispus*)	36	tr	tr-1
Yarrow (*Achillea millefolium*)	36	tr	--
Goldenrods (*Solidago* spp.)	27	16	3-40
Butterweed groundsel (*Senecio serra*)	27	4	tr-10
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	36	28	tr-80

Adjacent Vegetation

This association occurs within a variety of upland vegetation zones, from sagebrush and juniper through ponderosa pine, Douglas fir, grand fir and up into the subalpine fir zone.

Successional Dynamics

So long as the alluvial bars on which this association occurs are flooded and disturbed by debris scour and deposition, black cottonwood seedlings can become established. Seeds are distributed in the spring and contain little endosperm. Once germinated they must have adequate moisture until the root radical can reach the water table below the surface of the bar. Black cottonwood can also establish through the dispersal and subsequent rooting of branchlets and the burial of branches by debris.

Because of the wide amplitude of this association across most upland biozones, the succession of sites can be quite varied. Sites are alluvial bars that are young deposits of cobble-rich sediment. As the stream course changes and/or the streambed downcuts and finer sediments are deposited on bars, the bars will develop into floodplains and eventually terraces. Concurrent with this process of site succession, the vegetation will change over decades from black cottonwood-dominated to mesic shrub-dominated and then to sagebrush- or forest-dominated, depending upon the associated upland vegetation in the zone in which the site occurs.

Fires are probably infrequent in this association because of the high moisture content of the vegetation. Older black cottonwood trees may survive some low or moderate intensity fires due to its thick bark. Young and middle-aged plants would be killed by any fire on the site.

Other Studies Documenting Association with Plot Data
Washington: Kovalchik 2001
Idaho: Jankovsky-Jones *et al.* 2001; Holmstead 2001
Nevada: Manning and Padgett (1995) describe a *Populus*/Stream Bar Community Type that includes stands of *Populus balsamerifera* ssp. *trichocarpa* – Alluvial bar.
Montana: Hansen *et al.* 1995
Saskatchewan: Thompson and Hansen 2001

Populus balsamerifera ssp. trichocarpa/Salix lasiolepis Association

Black cottonwood/Arroyo willow Association
2 plots. New type

Ecoregional Range
BR

Environment and Soils
The Black cottonwood/Arroyo willow Association occurs in the southern Basin and Range Ecoregion at moderate elevations on streambanks. Valleys are narrow to moderately wide, moderate to high gradient and V-and box-shaped with moderately steep to steep sideslopes. Valley aspects are south- and west-facing. Associated Rosgen stream types are A2a+ and B3. This association has less precipitation and snowfall than the Black cottonwood-Alluvial bar Association.

Valley Environment	Average	Range
Elevation (ft)	4890	4780-5000
Plot Slope (%)	7	3.5-10
Valley Width (m)	43	20-65
Valley Gradient (%)	6	2-10
Valley Sideslopes (%)	58	45-70
Local Climate		
Mean Annual Precipitation (in.)	23	22-24
Mean Annual Snowfall (in.)	63	62-64
Mean Annual Temperature (F)	46	--
Mean Minimum Temperature (F)	34	32-34
Mean Maximum Temperature (F)	58	57-58
Median Date of Last Spring Freeze	June 7	June 6-June 8
Median Date of First Fall Freeze	Sep. 12	--

Vegetation Composition
Black cottonwood and arroyo willow are the dominant woody plants. Other shrubs that occurred on both sample sites are red-osier dogwood, Wood's rose and common chokecherry. Other willows and currants occur at low cover. Herbaceous species are very sparse, occurring at low cover and include, field mint, dandelion, western clematis, stinging nettle, blue wildrye, Great Basin wildrye, common scouring rush and prairie sage.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Black cottonwood (*Populus balsamerifera* ssp. *trichocarpa*)	50	38	--
TREE OVERSTORY-SUBDOMINANTS			
Black cottonwood (*Populus balsamerifera* ssp. *trichocarpa*)	50	15	--
Western juniper (Juniperus occidentalis)	50	tr	--
TREE UNDERSTORY			
Black cottonwood (*Populus balsamerifera* ssp. *trichocarpa*)	50	3	--
SHRUBS			
Arroyo willow (*Salix lasiolepis*)	100	27	15-38
Red-osier dogwood (*Cornus sericea*)	100	8	tr-15
Wood's rose (*Rosa woodsii*)	100	tr	--
Common chokecherry (*Prunus virginiana*)	100	tr	--
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	100	tr	--
Great Basin wildrye (*Elymus cinereus*)	100	tr	--

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
sideslopes – Wyoming big sagebrush/Idaho fescue; western juniper/Wyoming big sagebrush

Successional Dynamics
So long as sites remain streambanks disturbed by fluvial processes, this association will probably not succeed to another association. As the stream course changes, other black cottonwood associations may develop on the streambanks and, ultimately, sites will probably develop into sagebrush or western juniper associations.

Other Studies Documenting Association
none

Populus balsamerifera ssp. trichocarpa/Salix lucida Association

Black cottonwood/Shining willow Association
2 plots. CEGL003431.

Ecoregional Range
BM

Environment and Soils
The Black cottonwood/Shining willow Association is found on low to mid-elevation alluvial bars and in abandoned channels of major rivers and streams. Sampled sites are in broad, low gradient, trough- or flat-shaped valleys with moderately steep to steep sideslopes. Valley aspects are southeast-facing. This association develops on coarse alluvial deposits of sands, gravels, cobbles, and boulders. Rosgen Stream types adjacent to sampled areas are C3 and C4. Stream widths varied from 15-30 m. This association has higher precipitation and snowfall and lower temperatures than the Black cottonwood-Alluvial Bar Association.

Valley Environment	Average	Range
Elevation (ft)	3750	3000-4500
Plot Slope (%)	0.8	0.5-1
Valley Width (m)	200	--
Valley Gradient (%)	1	0.5-2
Valley Sideslopes (%)	58	45-70
Local Climate		
Mean Annual Precipitation (in.)	36	23-48
Mean Annual Snowfall (in.)	123	46-201
Mean Annual Temperature (F)	43	40-47
Mean Minimum Temperature (F)	31	27-35
Mean Maximum Temperature (F)	55	52-58
Median Date of Last Spring Freeze	June 11	May 28-June 25
Median Date of First Fall Freeze	Sep. 16	Sep. 5-Sep. 19
Soil Characteristics		
Depth to 80% Coarse Fragments (cm)	15	0-30
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	27	1-52
Gravel	3	0-5
Rock	2	0-3
Cryptogam	tr	0-1
Litter	69	40-98

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
terraces - ponderosa pine/common snowberry;
sideslopes - grand fir associations, ponderosa pine/Idaho fescue-bluebunch wheatgrass and ponderosa pine/common snowberry.

Vegetation Composition

Black cottonwood and shining willow are pioneering trees and shrubs on coarse-textured alluvial surfaces on major rivers or streams. One site was sampled with a mature cottonwood overstory in an abandoned channel and had abundant smallfruit bulrush and bladder sedge. Because of continued disturbance from seasonal flooding, development into mature stands is probably rare. Conifer regeneration may be present but will not develop unless protected from the annual cycle of scouring, flooding, and ice damage on these sites (Hansen and others 1991). The herbaceous layer height averaged 61 cm. Herbaceous biomass for one site was 567 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	50	60	--
TREE UNDERSTORY			
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	100	11	tr-22
Ponderosa pine (*Pinus ponderosa*)	50	8	--
Engelmann spruce (*Picea engelmannii*)	50	3	--
SHRUBS			
Shining willow (*Salix lucida*)	100	38	20-55
Mackenzie's willow (*Salix prolixa*)	50	5	--
Mountain alder (*Alnus incana*)	50	3	--
SEDGES and RUSHES			
Smallfruit bulrush (*Scirpus microcarpus*)	50	25	--
Bladder sedge (*Carex utriculata*)	50	15	--
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	100	2	1-2
Fowl bluegrass (*Poa palustris*)	50	3	--
Creeping bentgrass (*Agrostis stolonifera*)	50	2	--
Blue wildrye (*Elymus glaucus*)	50	1	--
PERENNIAL FORBS			
Straightbeak buttercup (*Ranunculus orthorhyncus*)	50	50	--
Astragalus (*Astragalus* spp.)	50	14	--
Dandelion (*Taraxacum officinale*)	50	5	--
Yarrow (*Achillea millefolium*)	50	4	--
Leafy aster (*Aster foliaceus*)	50	4	--
Great North aster (*Aster modestus*)	50	2	--

Successional Dynamics

So long as the alluvial bars on which this association occurs are flooded and disturbed by debris scour and deposition, black cottonwood and shining willow seedlings can become established. Seeds are distributed in the spring and contain little endosperm. Once germinated they must have adequate moisture until the root radical can reach the water table below the surface of the bar. Both black cottonwood and shining willow can also establish through the dispersal and subsequent rooting of branchlets and the burial of branches by debris.

As the stream course changes and/or the streambed downcuts and finer sediments are deposited on bars, the bars will develop into floodplains and eventually terraces. Concurrent with this process of site succession, the vegetation will change over decades from black cottonwood-dominated to mesic shrub-dominated and then ponderosa pine or grand fir-dominated.

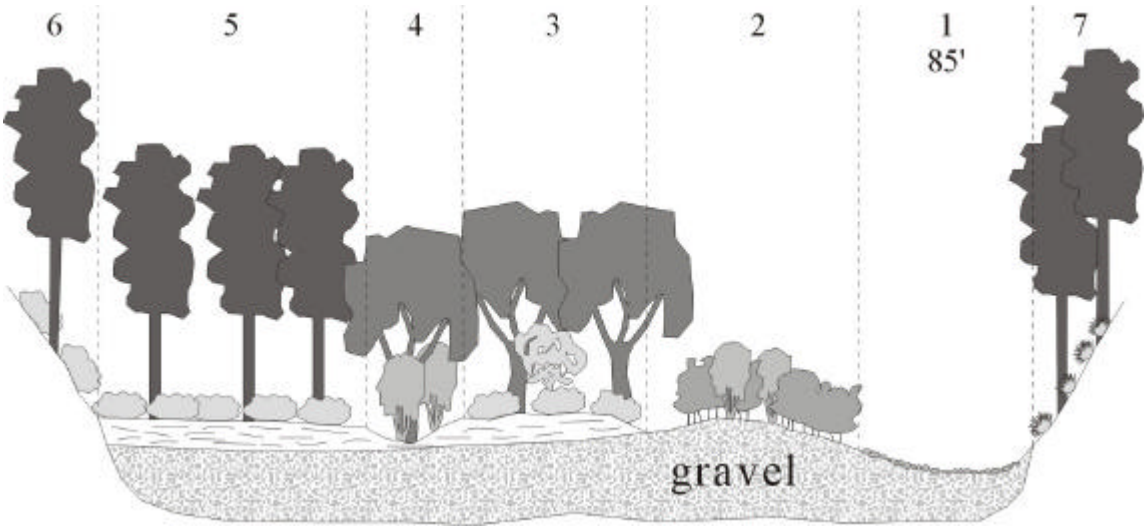
Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997
Washington: Crawford (2001) describes a *Populus balsamerifera* ssp. *trichocarpa* Association that includes stands that would fit this association
Idaho: Moseley 1998: 16; Jankovsky-Jones 2001
Nevada: Manning and Padgett (1995) describe a *Populus/Salix* Community Type that includes stands that would fit this association

Other Studies Documenting Association without Plot Data
Montana: Hansen *et al.* 1995

Illustrations

1 C4 stream reach
2 **Coyote willow-Shining willow-Red-osier dogwood/Creeping spikerush**, point bar
3 **Black cottonwood/Common snowberry**, floodplain
4 **Black cottonwood/Shining willow**, overflow channel
5 **Ponderosa pine/common snowberry**, inactive floodplain/terrace
6 Ponderosa pine/common snowberry, north-facing sideslope
7 Ponderosa pine/Idaho fescue-bluebunch wheatgrass, south-facing sideslope



Grande Ronde River, La Grande RD, Wallowa-Whitman NF; mod. gradient, low elevation, trough-shaped valley; Blue Mountains Ecoregion

Populus balsamerifera ssp. trichocarpa-Alnus rhombifolia Association

Black cottonwood-White alder Association
8 plots. CEGL000668

Ecoregional Range
BM, BR, CB, WV

Environment and Soils

The Black cottonwood-White alder Association was sampled at low elevations on the Snake River, the lower John Day River and the Wenaha River in the Blue Mountains Ecoregion but is also found in the Columbia Basin, the Owyhee Uplands portion of the Northern Basin and Range, and the Willamette Valley Ecoregions. Geomorphic surfaces on which this association is found are alluvial bars, streambanks, and incipient floodplains. Sites are coarse-fragment rich and frequently disturbed by flood scour and deposition. Valleys are moderate to high gradient, narrow to wide, flat-, box-, trough- and V-shaped valleys with moderately steep to steep sideslopes. Valley aspects are northeast, east southeast and south. Associated Rosgen stream types are A2, A3, B2, B3, C3 and DA. The local climate of this association is drier, less snowy and warmer than the Black cottonwood-Alluvial bar Association and moister, snowier and cooler than the White alder-Alluvial bar Association.

Valley Environment	Average	Range
Elevation (ft)	2013	1720-2520
Plot Slope (%)	10	1-50
Valley Width (m)	63	5-200
Valley Gradient (%)	6	2-10
Valley Sideslopes (%)	54	45-70
Local Climate		
Mean Annual Precipitation (in.)	17	15-23
Mean Annual Snowfall (in.)	27	17-57
Mean Annual Temperature (F)	49	46-51
Mean Minimum Temperature (F)	37	34-38
Mean Maximum Temperature (F)	61	56-64
Median Date of Last Spring Freeze	May 23	May 15-June 10
Median Date of First Fall Freeze	Sep. 26	Sep. 17-Oct. 1
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	14	0-60
Gravel	5	0-18
Rock	30	0-80
Cryptogam	10	0-50
Litter	38	5-88

Vegetation Composition

Black cottonwood and white alder co-dominate the tree overstory. Both species, as well as Ponderosa pine on some sites, form a scattered regeneration layer. Shrub and herbaceous cover is generally low as sites are frequently disturbed by flood scour and deposition, preventing the development of fine-textured soils and the establishment of shrubs and herbaceous species. Commonly occurring shrubs are Lewis' mockorange, red-osier dogwood, western serviceberry, black hawthorn and common snowberry. Greater shrub cover indicates a longer absence of fluvial disturbance. Common herbaceous species are blue wildrye, Kentucky bluegrass, yarrow, western clematis, cleavers and miners' lettuce. Average height of shrub overstory is 4.4 m, ranging from 1-6.2m. Average height of shrub understory is 1m, ranging from 0.9 to 1.2m. Herbaceous layer averages 44cm in height, ranging from 31 to 51 cm. Herbaceous biomass is approximately 800-900 lbs/acre.

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are:
terraces – Douglas fir/black hawthorn-common snowberry
sideslopes – Douglas fir/oceanspray, Idaho fescue-bluebunch wheatgrass; Douglas fir/mallow ninebark, big sagebrush/Idaho fescue-bluebunch wheatgrass, Ponderosa pine associations

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
White alder (*Alnus rhombifolia*)	50	50	40-60
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	50	37	30-40
TREE OVERSTORY-SUBDOMINANTS			
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	75	18	8-40
White alder (*Alnus rhombifolia*)	50	53	15-75
TREE UNDERSTORY			
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	75	2	tr-3
Ponderosa pine (*Pinus ponderosa*)	25	5	4-5
White alder (*Alnus rhombifolia*)	13	10	--
SHRUBS			
Lewis' mockorange (*Philadelphus lewisii*)	88	15	8-40
Red-osier dogwood (*Cornus sericea* spp. *sericea*)	88	7	1-15
Western serviceberry (*Amelanchior alnifolia*)	63	3	tr-8
Black hawthorn (*Crataegus douglasii*)	50	8	tr-15
Common snowberry (*Symphoricarpos albus*)	38	22	15-35
Poison ivy (*Rhus radicans*)	38	10	tr-20
Wood's rose (*Rosa woodsii*)	38	3	tr-5
Golden currant (*Ribes aureum*)	38	2	tr-3
SEDGES and RUSHES			
Dewey's sedge (*Carex deweyana*)	38	7	1-20
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	63	4	tr-8
Kentucky bluegrass (*Poa pratensis*)	50	6	tr-10
PERENNIAL FORBS			
Yarrow (*Achillea millefolium*)	50	tr	--
Western clematis (*Clematis ligusticifolia*)	50	tr	--
ANNUAL FORBS and GRASSES			
Cleavers (*Galium aparine*)	75	1	tr-3
Miners lettuce (*Montia perfoliata*)	50	tr	tr-1

Successional Dynamics

So long as the alluvial bars, streambanks and incipient floodplains on which this association occurs are flooded and disturbed by debris scour and deposition, black cottonwood and white alder seedlings can become established. Seeds are distributed in the spring and contain little endosperm. Once germinated they must have adequate moisture until the root radical can reach the water table below the surface of the bar. Black cottonwood can also establish through the dispersal and subsequent rooting of branchlets and the burial of branches by debris.

As the stream course changes and/or the streambed downcuts and finer sediments are deposited on bars, alluvial bars, streambanks and incipient floodplains will develop into floodplains and eventually terraces. Concurrent with this process of site succession, the vegetation will change over decades from black cottonwood and white alder-dominated to mesic shrub-dominated and then to sagebrush- or forest-dominated, depending upon the associated upland vegetation in the zone in which the site occurs.

Fires are probably infrequent in this association because of the high moisture content of the vegetation. White alder is not fire resistant and will be killed by even low intensity fires. Older black cottonwood trees may survive some low or moderate intensity fires due to its thick bark. In this association, however, most of the black cottonwood plants are young to middle-aged plants that would probably be killed by any fire on the site.

Associated shrubs will resprout from rhizomes and/or root crowns.

Other Studies Documenting Association with Plot Data

Idaho: Holmstead 2001

Populus balsamerifera ssp. trichocarpa/Philadelphus lewisii Association

Black cottonwood/Lewis' mockorange Association
7 plots. New type

Ecoregional Range
BM, BR, CB, EC

Valley Environment	Average	Range
Elevation (ft)	2020	1000-2560
Plot Slope (%)	4	tr-8
Valley Width (m)	84	5-350
Valley Gradient (%)	4	2-10
Valley Sideslopes (%)	51	15-70
Local Climate		
Mean Annual Precipitation (in.)	19	13-28
Mean Annual Snowfall (in.)	39	19-72
Mean Annual Temperature (F)	48	45-50
Mean Minimum Temperature (F)	36	33-38
Mean Maximum Temperature (F)	60	56-62
Median Date of Last Spring Freeze	May 27	May 18-June 5
Median Date of First Fall Freeze	Sep. 24	Sep. 15-Sep. 29
Soil Surface Cover (%)		
Submerged	tr	0-2
Bare Ground	6	0-25
Gravel	2	0-5
Rock	20	tr-75
Cryptogam	3	0-10
Litter	66	15-95

Environment and Soils
The Black cottonwood/Lewis' mockorange Association was sampled at low elevations in the Columbia Basin and Blue Mountains Ecoregions but is also found in the northern Basin and Range and East Cascades Ecoregions. Sites are cobble-rich floodplains, most of which are probably infrequently flooded, especially when compared with the Black cottonwood-Alluvial bar Association. Valleys are moderate to high gradient, very narrow to very wide, flat-, V-, box- and trough-shaped with gentler to very steep sideslopes. Valley aspects are mostly north, northeast and southeast. Adjacent Rosgen stream types are A4, B2, and C3. Local climate for this association is wetter and snowier (although temperatures are similar) than the White alder/Lewis' Mockorange Association.

Vegetation Composition
Black cottonwood dominates the tree overstory. Occasionally Ponderosa pine or grand fir trees are scattered in the overstory. Most sites have black cottonwood regeneration. Lewis' mockorange is the shrub overstory dominant with black hawthorn and western serviceberry scattered at low cover. Shrub understory species include common snowberry, Wood's rose and poison ivy. The herbaceous layer comprises mainly nonnative disturbance species such as Kentucky bluegrass, chervil, cheatgrass, cleavers and common hounds-tongue. Common native herbs are western clematis and blue wildrye.

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
sideslopes – Big sagebrush/Idaho fescue-bluebunch wheatgrass, Idaho fescue-bluebunch wheatgrass

Successional Dynamics
As floodplains become drier and more well-developed, sites may succeed to the Ponderosa pine/Douglas hawthorn-common snowberry Association.

Fires are probably infrequent in this association because of the high moisture content of the vegetation. Older black cottonwood trees may survive some low or moderate intensity fires due to its thick bark. Young and middle-aged plants would be killed by any fire on the site. Following fire, Lewis' mockorange and other shrubs will resprout from rhizomes and/or root crowns.

Other Studies Documenting Association with Plot Data
Idaho: Holmstead 2001

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	100	50	20-80
TREE OVERSTORY-SUBDOMINANTS			
Ponderosa pine (*Pinus ponderosa*)	29	4	--
Grand fir (*Abies grandis*)	14	25	--
White alder (*Alnus rhombifolia*)	14	15	--
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	14	7	--
TREE UNDERSTORY			
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	86	1	tr-3
SHRUBS			
Lewis' mockorange (*Philadelphus lewisii*)	100	25	12-40
Poison ivy (*Toxicodendron rydbergii*)	86	5	tr-15
Black hawthorn (*Crataegus douglasii*)	86	5	tr-10
Wood's rose (*Rosa woodsii*)	71	6	tr-15
Western serviceberry (*Amelanchior alnifolia*)	71	4	tr-10
Common snowberry (*Symphoricarpos albus*)	57	21	tr-70
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	71	7	tr-20
Kentucky bluegrass (*Poa pratensis*)	57	1	tr-2
PERENNIAL FORBS			
Western clematis (*Clematis ligusticifolia*)	57	3	--
Common hounds-tongue (*Cynoglossum officinale*)	57	tr	tr-1
ANNUAL GRASSES and FORBS			
Chervil (*Anthriscus scandicina*)	71	15	tr-60
Cheatgrass (*Bromus tectorum*)	71	1	tr-2
Cleavers (*Galium aparine*)	71	11	tr-50
Miners lettuce (*Montia perfoliata*)	43	tr	--
Common mullein (*Verbascum thapsus*)	43	tr	--
Prickly lettuce (*Lactuca serriola*)	43	tr	--

Populus balsamerifera ssp. trichocarpa/Betula occidentalis Association

Black cottonwood/Water birch Association
4 plots. New type

Ecoregional Range
BM, BR?, CB

Environment and Soils

The Black cottonwood/Western birch Association was sampled at low elevations in the far eastern Blue Mountains Ecoregion, though it may also occur throughout the Blue Mountains Ecoregion and in the Columbia Basin and northeastern part of the Basin and Range Ecoregion. Geomorphic surfaces are floodplains and streambanks. Valleys are high gradient, narrow to moderately wide, and V-, flat- and trough-shaped with gentle to moderately steep sideslopes. Valley aspects are north, northeast and east. Adjacent Rosgen stream types are A3 and A4. Soils are more well-developed and surface horizons are finer-textured than those of the Black cottonwood/Willow, Alluvial bar and Lewis' mockorange associations.

Valley Environment	Average	Range
Elevation (ft)	2026	1840-2280
Plot Slope (%)	9	7-10
Valley Width (m)	30	5-65
Valley Gradient (%)	9	7-10
Valley Sideslopes (%)	35	15-45
Local Climate		
Mean Annual Precipitation (in.)	13	13-15
Mean Annual Snowfall (in.)	23	20-29
Mean Annual Temperature (F)	49	48-50
Mean Minimum Temperature (F)	37	36-38
Mean Maximum Temperature (F)	60	59-62
Median Date of Last Spring Freeze	May 20	May 17-May 22
Median Date of First Fall Freeze	Sep. 26	Sep. 24-Sep. 27
Soil Characteristics		
Thickness of Epipedon (cm)	15	--
Depth to Redoximorphic Features (cm)	58	40-75
Depth to 30% Coarse Fragments (cm)	28	15-40
Soil Surface Cover (%)		
Submerged	4	0-8
Bare Ground	-	-
Gravel	-	-
Rock	5	1-10
Cryptogam	24	1-67
Litter	62	10-90

Vegetation Composition

Black cottonwood dominates the tree overstory. White alder is occasionally present in the overstory and understory layers. Water birch forms the highest shrub canopy (averaging 15 m in height). The middle shrub canopy (averaging 6 m in height) is dominated by Lewis' mockorange, western serviceberry, common chokecherry, black hawthorn, oceanspray, blue elderberry, and red-osier dogwood. The shrub understory (averaging 1 m in height) comprises mainly common snowberry, poison ivy and thimbleberry. The herbaceous layer (averaging 25 cm in height) includes blue wildrye, common hounds'tongue, feathery Solomon plume, burdock, common scouring rush, cleavers and a variety of other forbs.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	100	34	25-45
TREE OVERSTORY-SUBDOMINANTS			
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	25	3	--
White alder (*Alnus rhombifolia*)	25	3	--
TREE UNDERSTORY			
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	50	1	--
White alder (*Alnus rhombifolia*)	50	1	--
SHRUBS			
Water birch (*Betula occidentalis*)	100	26	10-45
Lewis' mockorange (*Philadelphus lewisii*)	100	21	10-33
Poison ivy (*Toxicodendron rydbergii*)	75	25	1-70
Common snowberry (*Symphoricarpos albus*)	75	18	15-20
Red-osier dogwood (*Cornus sericea* spp. *sericea*)	75	13	8-16
Western serviceberry (*Amelanchior alnifolia*)	75	12	10-15
Common chokecherry (*Prunus virginiana*)	75	11	2-22
Thimbleberry (*Rubus parviflorus*)	50	33	1-65
Black hawthorn (*Crataegus douglasii*)	50	24	8-40
SEDGES and RUSHES			
Dewey's sedge (*Carex deweyana*)	50	2	tr-3
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	100	18	tr-70
Kentucky bluegrass (*Poa pratensis*)	50	9	8-10
PERENNIAL FORBS			
Common hounds-tongue (*Cynoglossum officinale*)	75	tr	--
Feathery Solomonplume (*Smilacina racemosa*)	50	tr	tr-1
Burdock (*Arctium minus*)	50	tr	--
FERNS and HORSETAILS			
Common scouring rush (*Equisetum hyemale*)	75	1	tr-3
ANNUAL GRASSES and FORBS			
Cleavers (*Galium aparine*)	75	3	tr-5

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are:
sideslopes – Idaho fescue-bluebunch wheatgrass

Successional Dynamics

Western birch is relatively long-lived and persistent on stable sites. Birch seedlings need bare, moist mineral substrate and also shade for 2-3 months during their first summer and thus are probably established infrequently on sites of fine-textured deposition on established floodplains. As floodplains become drier, farther from the floodprone zone of the stream and more well-developed, sites may succeed to the Douglas fir/Western birch Association or, if young western birch is no longer established on sites, the Douglas fir/Black hawthorn Association.

Fires will topkill western birch plants. The plants may resprout from basal buds following fires. Older black cottonwood trees may survive some low or moderate intensity fires due to its thick bark. Young and middle-aged plants would be killed by any fire on the site. Following fire, middle and understory shrubs will resprout from rhizomes and/or root crowns.

Other Studies Documenting Association with Plot Data

Nevada: Manning and Padgett (1995) describe a *Populus/Betula occidentalis* Community Type that includes stands that would fit this association

Populus trichocarpa ssp. balsamerifera/Crataegus douglasii Association

Black cottonwood/Black hawthorn Association
8 plots. CEGL000673

Ecoregional Range
BM, CB, EC

Environment and Soils

The Black cottonwood/Black hawthorn Association is found in the Blue Mountains, Columbia Basin and East Cascades Ecoregions at low to moderate elevations. Geomorphic surfaces on which this association occurs are high floodplains and terraces. Valleys are moderate (occasionally high) gradient, narrow to very wide and flat-, V- and trough-shaped with moderately steep to steep sideslopes. Valley aspects are east, southeast and southwest. Adjacent Rosgen stream types are A3, B2, B3, C1 and C4. Average annual precipitation and snowfall are higher and temperatures are somewhat lower than for the White alder/Black hawthorn Association.

Valley Environment	Average	Range
Elevation (ft)	2964	1860-3820
Plot Slope (%)	3	1-8
Valley Width (m)	129	20-350
Valley Gradient (%)	3	2-10
Valley Sideslopes (%)	54	15-70
Local Climate		
Mean Annual Precipitation (in.)	20	13-31
Mean Annual Snowfall (in.)	46	19-80
Mean Annual Temperature (F)	47	44-50
Mean Minimum Temperature (F)	35	30-38
Mean Maximum Temperature (F)	59	56-62
Median Date of Last Spring Freeze	June 2	May 16-June 24
Median Date of First Fall Freeze	Sep. 18	Sep. 3-Sep. 29
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	6	0-25
Gravel	-	-
Rock	8	0-60
Cryptogam	2	0-10
Litter	81	11-100

Vegetation Composition

Black cottonwood is dominant in the tree overstory and understory. The occasional occurrence of Ponderosa pine and grand fir is indicative of the cooler, moisture upland vegetation zone in which this association occurs. Black hawthorn dominates the shrub overstory which also occasionally contains scattered western serviceberry, Lewis' mockorange and Rocky Mountain maple. The shrub understory is dominated by common snowberry. Herbaceous plants are varied, occur at variable cover and include blue wildrye, Kentucky bluegrass, starry false-Solomon's seal, mountain sweet cicily, common cowparsnip and butterweed groundsel. Average height of the shrub overstory is 5.2 m, ranging from 4.6-6.2 m. Average height of the shrub understory is 1.2m, ranging from 0.9-1.5m. Average height of the herbaceous layer is 25 cm, ranging from 18-31 cm. Herbaceous biomass averages 1054 lbs/acre, ranging from 256-2033 lbs/acre.

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are:
terraces – black cottonwood/common snowberry, Ponderosa pine/common snowberry, Ponderosa pine/black hawthorn-common snowberry
sideslopes – Ponderosa pine/mallow ninebark; Douglas fir associations, Ponderosa pine associations, Idaho fescue-bluebunch wheatgrass; western juniper associations

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	100	45	20-85
Ponderosa pine (*Pinus ponderosa*)	25	13	11-15
TREE OVERSTORY-SUBDOMINANTS			
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	63	5	1-10
Grand fir (*Abies grandis*)	13	2	--
Ponderosa pine (*Pinus ponderosa*)	13	tr	--
TREE UNDERSTORY			
Black cottonwood (*Populus balsamerifera* ssp. *trichocarpa*)	50	1	tr-2
Grand fir (*Abies grandis*)	38	4	tr-6
Ponderosa pine (*Pinus ponderosa*)	25	tr	--
SHRUBS			
Black hawthorn (*Crataegus douglasii*)	100	47	13-85
Common snowberry (*Symphoricarpos albus*)	88	40	15-60
Western serviceberry (*Amelanchior alnifolia*)	63	4	2-10
Lewis' mockorange (*Philadelphus lewisii*)	50	20	3-40
Wood's rose (*Rosa woodsii*)	50	3	tr-6
Rocky Mountain maple (*Acer glabrum*)	50	tr	tr-1
SEDGES and RUSHES			
Dewey's sedge (*Carex deweyana*)	50	4	tr-12
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	75	9	tr-30
Kentucky bluegrass (*Poa pratensis*)	50	28	3-60
PERENNIAL FORBS			
Starry false Solomon's seal (*Smilacina stellata*)	63	12	1-30
Mountain sweet cicily (*Osmorhiza chilensis*)	63	1	tr-2
Common cowparsnip (*Heracleum lanatum*)	50	5	tr-9
Butterweed groundsel (*Senecio serra*)	50	3	tr-8
Enchanter's nightshade (*Circaea alpina*)	50	3	tr-6
Sweet-scented bedstraw (*Galium trifolium*)	50	2	tr-4
Feathery Solomonplume (*Smilacina racemosa*)	50	2	tr-5

Successional Dynamics

With the drying of further development of floodplains into terraces, sites will probably succeed toward the Ponderosa pine/Common snowberry, Douglas fir/Common snowberry or possibly to a drier grand fir association as indicated by the tree seedling, sapling and and smaller overstory trees composition on the site. The adjacent toeslope upland vegetation will provide some idea of the potential future vegetation. Black cottonwood will not regenerate if sites are too far removed from the flood deposition and/or scour needed to produce black cottonwood seedling establishment sites.

Older black cottonwood trees may survive some low or moderate intensity fires due to its thick bark. All of the other commonly occurring shrubs in this association can resprout from rhizomes and/or root crowns following fires.

Other Studies Documenting Association with Plot Data

Oregon: Kauffman *et al.* 1985: 17; Kauffman 1982.
Idaho: Jankovsky-Jones *et al.* 2001

Populus balsamerifera ssp. trichocarpa/Alnus incana-Cornus sericea ssp. sericea Association

Black cottonwood/Mountain alder-Red-osier dogwood Association
17 plots. CEGL000667 and CEGL000672 combined.

Ecoregional Range
BM, EC

Environment and Soils
The Black cottonwood/Mountain alder-Red-osier Dogwood Association occurs at moderate elevations throughout the Blue Mountains and High Plains Ecoregions as well as in the southern East Cascades Ecoregion. Sites are incipient floodplains and some streambanks. Valleys are moderate to high gradient, narrow to wide and V- and flat- with gentle to steep sideslopes. Valley aspects are southeast, southwest and northwest. Associated Rosgen stream types are B3, B4, and C3. Stream widths range from 1.5-10 m. Soils consist of fine or coarse-textured mineral material over alluvial coarse sand, gravel, cobble and boulders. These sites flood frequently; the water table retreats to a depth of 30-100 cm during the growing season.

Vegetation Composition
The tree overstory is dominated by black cottonwood with scattered regeneration of both cottonwood and conifers. The presence of Engelmann spruce in this association is indicative of the high available soil moisture. In the tall shrub layer, mountain alder and/or red-osier dogwood are abundant. Common snowberry, prickly currant, western serviceberry, black hawthorn, thimbleberry and Rocky Mountain maple are common. A diverse herbaceous understory may have sweet-scented bedstraw, enchanter's nightshade, mountain sweet-cicily, stream violet, largeleaf avens, blue wildrye, smallfruit bulrush, common horsetail or Kentucky bluegrass as important components. Average height of the shrub overstory is 3.3 m, ranging from 1.5-6.2 m. Average height of the shrub understory is 1.1 m, ranging from 0.9 to 1.8 m. The herbaceous layer averages 53 cm in height, ranging from 28-81 cm. Herbaceous biomass averages 856 lbs/acre.

Valley Environment	Average	Range
Elevation (ft)	4028	2920-5600
Plot Slope (%)	4	tr-12
Valley Width (m)	85	20-350
Valley Gradient (%)	4	2-10
Valley Sideslopes (%)	48	15-70
Local Climate		
Mean Annual Precipitation (in.)	33	11-59
Mean Annual Snowfall (in.)	124	23-263
Mean Annual Temperature (F)	43	40-47
Mean Minimum Temperature (F)	32	27-35
Mean Maximum Temperature (F)	54	49-61
Median Date of Last Spring Freeze	June 16	June 4-July 1
Median Date of First Fall Freeze	Sep. 10	Aug. 28-Sep. 22
Soil Characteristics		
Depth to 30% Coarse Fragments (cm)	33	10-58
Soil Surface Cover (%)		
Submerged	tr	0-5
Bare Ground	9	0-35
Gravel	1	0-5
Rock	4	0-20
Moss	8	0-33
Liverwort	tr	0-tr
Lichen	tr	0-3
Litter	73	20-97

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	100	39	8-75
Engelmann spruce (*Picea engelmannii*)	12	12	3-20
Grand fir (*Abies grandis*)	12	4	3-5
TREE OVERSTORY-SUBDOMINANTS			
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	18	18	3-25
Grand fir (*Abies grandis*)	18	18	1-10
Lodgepole pine (*Pinus contorta*)	12	12	--
Engelmann spruce (*Picea engelmannii*)	12	12	--
TREE UNDERSTORY			
Grand fir (*Abies grandis*)	47	11	tr-40
Black cottonwood (*Populus balsamerifera* spp. *trichocarpa*)	47	7	tr-30
Engelmann spruce (*Picea engelmannii*)	29	2	1-4
SHRUBS			
Mountain alder (*Alnus incana*)	94	33	1-80
Red-osier dogwood (*Cornus sericea*)	77	27	tr-75
Common snowberry (*Symphoricarpos albus*)	65	7	tr-40
Prickly currant (*Ribes lacustre*)	59	3	1-7
Black hawthorn (*Crataegus douglasii*)	47	5	tr-10
Western serviceberry (*Amelanchior alnifolia*)	47	2	tr-8
Thimbleberry (*Rubus parviflorus*)	41	12	tr-60
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	65	2	tr-5
Kentucky bluegrass (*Poa pratensis*)	47	2	tr-4
PERENNIAL FORBS			
Sweet-scented bedstraw (*Galium trifolium*)	77	6	tr-30
Enchanter's nightshade (*Circaea alpina*)	59	9	tr-60
Mountain sweet cicily (*Osmorhiza chilensis*)	59	3	tr-15
Common cowparsnip (*Heracleum lanatum*)	47	4	tr-20
Large-leaf avens (*Geum macrophyllum*)	47	2	tr-5
Stream violet (*Viola glabella*)	47	2	tr-3
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	65	tr	--

Successional Dynamics

These sites are still fairly frequently flooded and so long as the alluvial bars on which this association occurs are flooded and disturbed by debris scour and deposition, black cottonwood seedlings can become established and conifer seedlings will not dominant the regeneration layer.

As floodplains accumulate more sediments and are farther removed vertically from the floodprone zone or if the stream course changes and floodplain soils become drier, sites will probably succeed to either the Grand fir/Rocky Mountain maple Association or the Grand fir/Common snowberry Association.

Fires are probably infrequent in this association because of the high moisture content of the vegetation. Older black cottonwood trees may survive some low or moderate intensity fires due to its thick bark. Young and middle-aged plants would be killed by any fire on the site. Grand fir and Engelmann spruce are also susceptible to fire. The common shrubs in this association can resprout from rhizomes and/or root crowns if their aboveground stems are killed by fires.

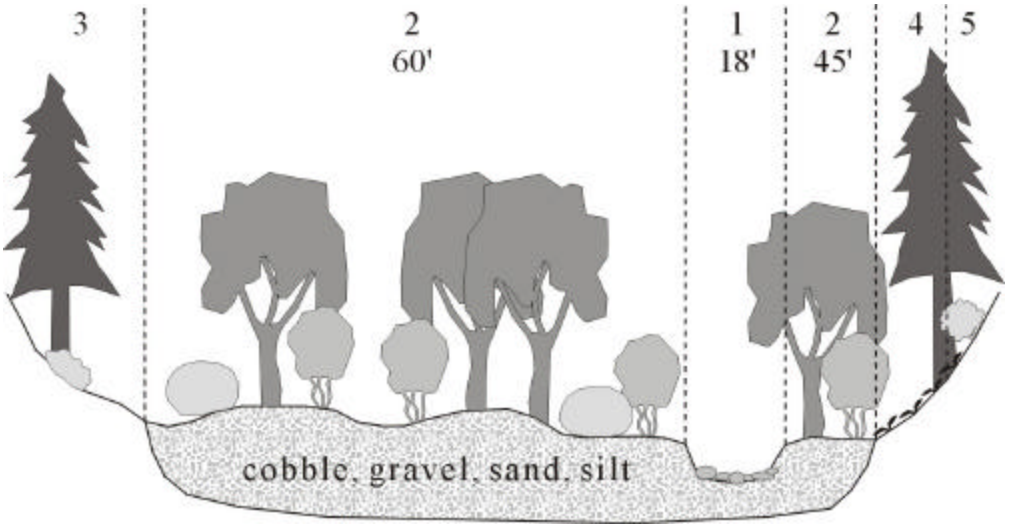
Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
terraces – grand fir/False bugbane, grand fir/common snowberry, other grand fir-Engelmann spruce communities; sideslopes – Western juniper/bitterbrush/Bluebunch wheatgrass, Ponderosa pine/common snowberry, grand fir/mallow ninebark, grand fir/pinegrass, grand fir/Big huckleberry, grand fir/queen's cup beadlily, and other grand fir, white fir and western hemlock associations.

Other Studies Documenting Association with Plot Data
Oregon: Kovalchik 1987; Crowe and Clausnitzer 1997; Kauffman 1982: 60, 61; Kauffman *et al.* 1985: 17; McNeil 1975: 85; Ferro *et al.* 1976: 13; Wooten and Morrison 1995: 77
Washington: Kovalchik 2001 (POBAT/Mountain alder (*Alnus incana*), POBAT/Red-osier dogwood (*Cornus sericea*), POBAT/Mountain alder (*Alnus incana*) –Red-osier dogwood (*Cornus sericea*)
Montana: Hansen *et al.* 1995 (POBAT/COSES)
Saskatchewan: Thompson and Hansen 2001 (POBAT/COSES)

Other Studies Documenting Association without Plot Data
Oregon: Evans 1989: 17 (POBAT/COSES)

Illustrations

1 B3 stream reach
2 **Black cottonwood/mountain alder-red-osier dogwood**, floodplain
3 Grand fir/birchleaf spiraea, west-facing sideslope
4 Grand fir/queen's cup beadlily, east-facing toeslope
5 Grand fir/big huckleberry, east-facing sideslope



Clear Creek, Pine RD, Wallowa-Whitman NF; mod. high gradient, mod. elevation, V-shaped valley; Blue Mountains Ecoregion

*Populus balsamerifera ssp. trichocarpa/Acer circinatum Association**

Black cottonwood/Vine maple Association
1 plot. New type

Ecoregional Range
EC

Environment and Soils
One plot was sampled in the East Cascades Ecoregion at 2050 ft elevation, The site is a low gradient streambank in a moderately wide, low gradient V-shaped valley with moderately steep sideslopes. The associated Rosgen stream type is B3.

Vegetation Composition
Black cottonwood and Douglas fir comprise the tree overstory. Vine maple, Pacific ninebark, common snowberry, common chokecherry and beaked hazel co-dominate the shrub layer. Herbaceous species are sparse.

Dominant Species	Canopy Cover (%)
TREE OVERSTORY-DOMINANTS	
Black cottonwood (*Populus balsamerifera* ssp. *trichocarpa*)	38
Douglas fir (*Pseudotsuga menziesii*)	38
TREE OVERSTORY-SUBDOMINANTS	
Ponderosa pine (*Pinus ponderosa*)	15
Oregon white oak (*Quercus garryana*)	tr
TREE UNDERSTORY	
Douglas fir (*Pseudotsuga menziesii*)	tr
Oregon white oak (*Quercus garryana*)	tr
SHRUBS	
Vine maple (*Acer circinatum*)	15
Common snowberry (*Symphoricarpos albus*)	15
Common chokecherry (*Prunus virginiana*)	15
Beaked hazelnut (*Corylus cornuta*)	15
Pacific ninebark (*Physocarpus capitatus*)	15
PERENNIAL FORBS	
Sweet-scented bedstraw (*Galium trifolium*)	tr
Mountain sweet cicily (*Osmorhiza chilensis*)	tr
Feathery Solomonplume (*Smilacina racemosa*)	tr
Broadpetal strawberry (*Fragaria virginiana*)	tr
False bugbane (*Trautvettaria caroliniensis*)	tr

Adjacent Vegetation
The upland vegetation zone in which this site occurs is Douglas fir forest.

Other Studies Documenting Association
none

Populus balsamerifera ssp. trichocarpa/Acer glabrum Association

Black cottonwood/Rocky Mountain maple Association
7 plots. New type

Ecoregional Range
BM

Environment and Soils
The Black cottonwood/Rocky Mountain maple Association occurs at moderate elevations in the Wallowa and northern Blue Mountains of the Blue Mountains Ecoregion. Geomorphic sites are floodplains and terraces along Rosgen A2, B2, C3 and C4 stream types. Stream widths range from 2 to 15 m. Valleys are north- and southeast-facing, moderate to high gradient, narrow to moderately wide and V- or trough-shaped with moderately steep to steep sideslopes. Soils are composed of alluvial deposits of silt, sand, gravel, cobbles and stones.

Vegetation Composition
Black cottonwood dominates the overstory tree layer. Conifer species are regular components of sampled stands and dominate the lower tree layers. Rocky Mountain maple typifies a diverse shrub overstory, which also includes western serviceberry and black hawthorn. Common snowberry, thimbleberry and prickly currant are the dominants in the shrub understory. Mountain sweet-cicily, pathfinder, stream violet, sweet-scented bedstraw, western coneflower and stinging nettle are the most constant forbs. Blue wildrye and Columbia brome are important grass species encountered. Average height of the shrub overstory is 3.6 m, ranging from 1.5-4.9 m. Average height of the shrub understory is 0.7 m, ranging from 0.3 to 1.2 m. The average height of herbaceous vegetation is 64 cm, ranging from 41-76 cm. Herbaceous biomass averages 276 lbs/acre.

Valley Environment	Average	Range
Elevation (ft)	4017	2500-5380
Plot Slope (%)	5	3-12
Valley Width (m)	78	20-200
Valley Gradient (%)	6	5-10
Valley Sideslopes (%)	51	15-70
Local Climate		
Mean Annual Precipitation (in.)	42	26-61
Mean Annual Snowfall (in.)	165	59-368
Mean Annual Temperature (F)	42	34-46
Mean Minimum Temperature (F)	30	26-35
Mean Maximum Temperature (F)	54	46-59
Median Date of Last Spring Freeze	June 15	May 22-July 7
Median Date of First Fall Freeze	Sep. 11	Aug. 28-Sep. 25
Soil Characteristics		
Depth to 30% Coarse Fragments (cm)	17	0-92
Depth to 80% Coarse Fragments (cm)	20	0-92
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	tr	0-1
Gravel	2	0-10
Rock	13	0-60
Cryptogam	20	0-60
Litter	51	0-93

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Black cottonwood (*Populus balsamerifera* ssp. *trichocarpa*)	100	24	9-50
Douglas fir (*Pseudotsuga menziesii*)	43	9	6-10
TREE OVERSTORY-SUBDOMINANTS			
Black cottonwood (*Populus balsamerifera* ssp. *trichocarpa*)	71	11	1-35
Grand fir (*Abies grandis*)	43	6	tr-15
TREE UNDERSTORY			
Grand fir (*Abies grandis*)	100	13	3-50
Black cottonwood (*Populus balsamerifera* ssp. *trichocarpa*)	14	1	--
SHRUBS			
Rocky Mountain maple (*Acer glabrum*)	100	28	7-80
Common snowberry (*Symphoricarpos albus*)	86	31	2-75
Western serviceberry (*Amelanchior alnifolia*)	86	4	1-13
Thimbleberry (*Rubus parviflorus*)	57	18	tr-65
Red-osier dogwood (*Cornus sericea*)	57	13	1-25
Prickly currant (*Ribes lacustre*)	57	1	tr-2
Black hawthorn (*Crataegus douglasii*)	43	6	tr-10
SEDGES and RUSHES			
Dewey's sedge (*Carex deweyana*)	57	tr	tr-1
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	71	5	tr-20
Columbia brome (*Bromus vulgaris*)	43	7	tr-20
PERENNIAL FORBS			
Mountain sweet cicily (*Osmorhiza chilensis*)	71	2	tr-3
Sweet-scented bedstraw (*Galium trifolium*)	71	1	tr-2
Stinging nettle (*Urtica dioica*)	71	tr	--
Western coneflower (*Rudbeckia occidentalis*)	57	13	tr-42
Pathfinder (*Adenocaulon bicolor*)	57	2	tr-3
Stream violet (*Viola glabella*)	57	1	tr-3
Starry false Solomon's seal (*Smilacina stellata*)	43	4	1-8
Common cowparsnip (*Heracleum lanatum*)	43	2	tr-3
Hooker's fairybells (*Disporum hookeri*)	43	2	tr-3

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are:
sideslopes – grand fir/Rocky Mountain maple, grand fir/big huckleberry, grand fir/common snowberry, Douglas fir/mallow ninebark

Successional Dynamics

The constancy and abundance of grand fir regeneration indicates grand fir potential on the sites. This association is most likely successional to the Grand fir/Rocky Mountain maple Association or perhaps the Grand fir/Big huckleberry Association and may have succeeded from Black cottonwood/Mountain alder-Red-osier dogwood Association. One site seral to grand fir/swordfern-wild ginger (on Tiger Creek on Walla Walla District).

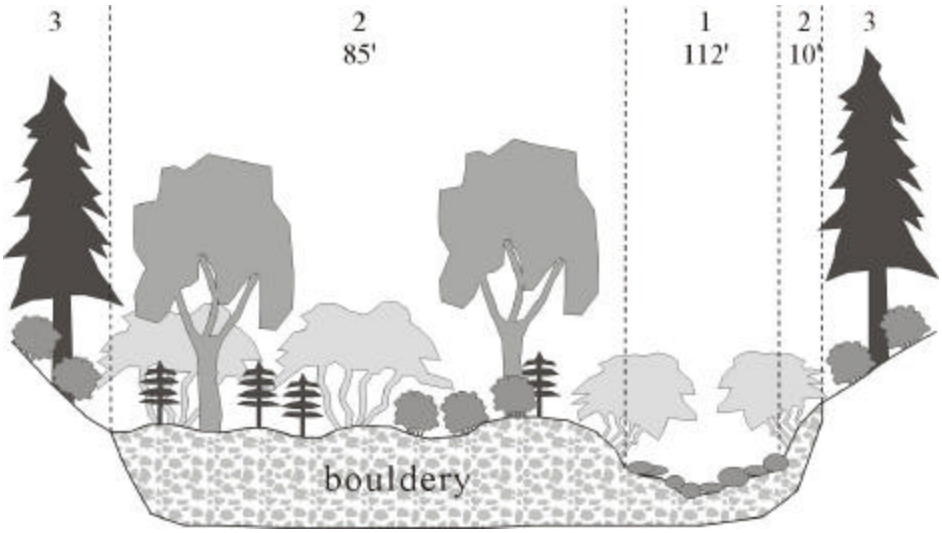
Older black cottonwood trees may survive some low or moderate intensity fires due to its thick bark. All of the other commonly occurring shrubs in this association can resprout from rhizomes and/or root crowns following fires.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997
Idaho: Jankovsky-Jones *et al.* 2001

Illustrations

1 B2 stream reach
2 **Black cottonwood/Rocky Mountain maple**, floodplain
3 Grand fir/big huckleberry, southwest- and northeast-facing sideslopes



Lake Fork, Pine RD, Wallowa-Whitman NF; mod. high gradient, mod. high elevation, flat-shaped valley; Blue Mountains Ecoregion

Populus balsamerifera ssp. trichocarpa/Symphoricarpos albus Association

Black cottonwood/Common snowberry Association
4 plots. CEGL000677

Ecoregional Range
BM, CB, EC

Environment and Soils
The Black cottonwood/ Common snowberry Associations occurs at low to moderate elevations in the Blue Mountains, Columbia Basin and East Cascades Ecoregions. Geomorphic surfaces are terraces and high floodplains that are flooded infrequently. Valleys are west- and southwest-facing, low gradient, wide, trough- and flat-shaped valleys with gentle to moderately steep sideslopes. Soils are deep alluvium of fine-textured surface horizons with sands, gravels, and rocks below.

Valley Environment	Average	Range
Elevation (ft)	3398	1400-4340
Plot Slope (%)	2	0.5-5
Valley Width (m)	275	200-350
Valley Gradient (%)	2	1-2
Valley Sideslopes (%)	30	15-45
Local Climate		
Mean Annual Precipitation (in.)	24	17-41
Mean Annual Snowfall (in.)	83	23-208
Mean Annual Temperature (F)	44	39-50
Mean Minimum Temperature (F)	31	27-38
Mean Maximum Temperature (F)	56	50-62
Median Date of Last Spring Freeze	June 22	May 16-July 6
Median Date of First Fall Freeze	Sep. 4	Aug. 21-Sep. 26
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	12	0-35
Gravel	tr	0-2
Rock	1	0-3
Cryptogam	tr	0-tr
Litter	86	60-100

Vegetation Composition

Black cottonwood dominates a tree overstory with conifers present in all layers. While irregular in occurrence, the conifer species, Ponderosa pine, Douglas fir and grand fir, may indicate community potential on these sites. The shrub component is dominated by the common snowberry understory with scattered Wood's rose and occasional black hawthorn and common chokecherry in the shrub overstory. Starry false-Solomon's seal, Kentucky bluegrass, butterweed groundsel and yarrow are regular members of the herbaceous understory. Less common in occurrence blue wildrye, rough bedstraw, heartleaf arnica, common cowparsnip, stinging nettle, and dandelion. Average height of shrub overstory is 3.4 m. Average height of herbaceous layer is 53 cm, ranging from 31-76 cm. Average herbaceous biomass is 1161 lbs/acre, ranging from 200-2033 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Black cottonwood (*Populus balsamerifera* ssp. *trichocarpa*)	100	48	20-63
Grand fir (*Abies grandis*)	25	13	--
Douglas fir (*Pseudotsuga menziesii*)	25	5	--
TREE OVERSTORY-SUBDOMINANTS			
Douglas fir (*Pseudotsuga menziesii*)	50	7	3-10
Ponderosa pine (*Pinus ponderosa*)	50	5	4-5
TREE UNDERSTORY			
Grand fir (*Abies grandis*)	50	1	--
Black cottonwood (*Populus balsamerifera* ssp. *trichocarpa*)	50	tr	tr-1
Ponderosa pine (*Pinus ponderosa*)	25	1	--
SHRUBS			
Common snowberry (*Symphoricarpos albus*)	75	50	35-60
Wood's rose (*Rosa woodsii*)	50	9	2-15
Black hawthorn (*Crataegus douglasii*)	50	2	tr-3
Common chokecherry (*Prunus virginiana*)	25	15	--
SEDGES and RUSHES			
Geyer's sedge (*Carex geyeri*)	50	3	1-5
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	75	28	15-40
Blue wildrye (*Elymus glaucus*)	50	16	2-30
PERENNIAL FORBS			
Starry false Solomon's seal (*Smilacina stellata*)	75	11	3-25
Butterweed groundsel (*Senecio serra*)	75	5	2-10
Yarrow (*Achillea millefolium*)	75	2	tr-3
Rough bedstraw (*Galium asperrimum*)	50	21	2-40
Heart-leaf arnica (*Arnica cordata*)	50	3	2-3
Dandelion (*Taraxacum officinale*)	50	2	--
Common cowparsnip (*Heracleum lanatum*)	50	2	tr-3
Stinging nettle (*Urtica dioica*)	50	1	tr-5
Meadow goldenrod (*Solidago canadensis*)	50	tr	--
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	50	2	tr-3
ANNUAL GRASSES and FORBS			
Cleavers (*Galium aparine*)	50	5	tr-10
Yellow salsify (*Tragopogon dubius*)	50	tr	--

Adjacent Vegetation

Upland vegetation types adjacent to sampled sites are:
terraces - ponderosa pine/common snowberry;
sideslopes - grand fir/pinegrass, grand fir/Rocky Mountain maple, grand fir/elk sedge, Douglas-fir-ponderosa pine and ponderosa pine/Idaho fescue-bluebunch wheatgrass.

Successional Dynamics

Sites may be successional to grand fir/snowberry, Douglas fir/snowberry or Ponderosa pine/snowberry associations, depending on the elevation and upland vegetation zone within which the site occurs, as evidenced by the occurrence of these different conifers on sites.

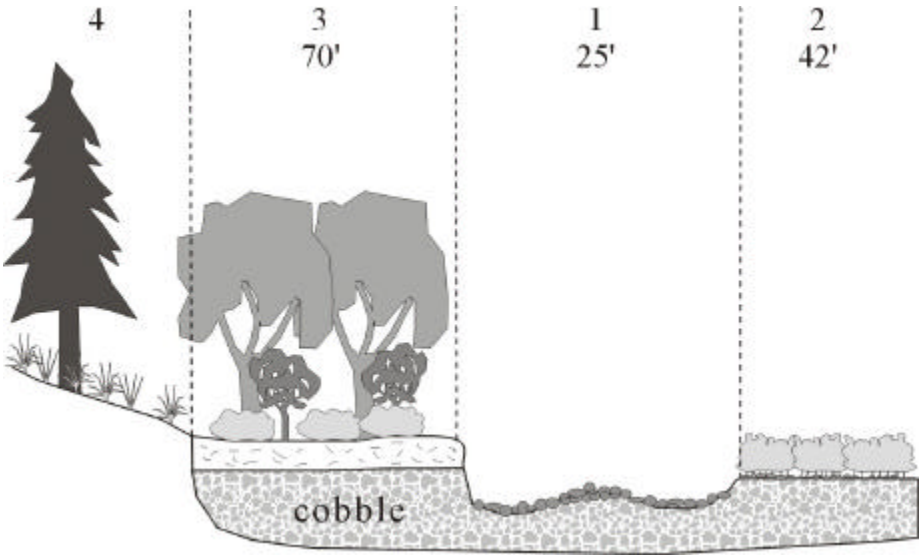
Older black cottonwood trees may survive some low or moderate intensity fires due to its thick bark. Mature Ponderosa pine can survive low and moderate intensity fires. Mature Douglas fir and grand fir may survive low intensity fires. Seedlings and saplings of all these conifer species are susceptible to fire. The shrub and graminoid species will resprout from rhizomes and/or root crowns following fires.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997: 94; Poulton 1955: 87; Kauffman 1982: 61; Kauffman *et al.* 1985: 17; Kovalchik 1987: 136
Washington: Kovalchik 2001
Idaho: Moseley 1998: 17
Montana: Hansen *et al.* 1995

Illustrations

1 D3 stream reach
2 **Dusky willow**, alluvial bar
3 **Black cottonwood/common snowberry**, inactive floodplain
4 Grand fir/pinegrass, west-facing sideslope



East Eagle Creek, Pine RD, Wallowa-Whitman NF; mod. gradient, mod. elevation, flat-shaped valley; Blue Mountains Ecoregion

Populus angustifolia/Alnus incana/Clematis ligusticifolia Association

Narrowleaf cottonwood/Mountain alder/Western clematis Association
2 plots. CEGL002642 = *Populus angustifolia/Alnus incana.*

Ecoregional Range
BR

Environment and Soils

The Narrowleaf cottonwood/Mountain alder/Western clematis Association is found in at moderate elevations in the Basin and Range Ecoregion. Sites are rocky streambanks in east-facing, high gradient, narrow, V- and trough-shaped valleys with moderately steep to steep sideslopes. Rosgen stream types are A2. This association is found on stream orders 1 and 2.

Valley Environment	Average	Range
Elevation (ft)	4760	4360-5160
Plot Slope (%)	4	--
Valley Width (m)	43	20-65
Valley Gradient (%)	9	7-10
Valley Sideslopes (%)	58	45-70
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	10	5-15
Gravel	5	--
Rock	25	--
Cryptogam	tr	--
Litter	60	55-65

Vegetation Composition

Narrowleaf cottonwood forms an open canopy over mountain alder and a western clematis herbaceous understory. Mean richness is 20.5, ranging from 16-25. Mean percent cover is 150, ranging from 140-160%.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Narrowleaf cottonwood (*Populus angustifolia*)	100	40	30-50
TREE UNDERSTORY			
Narrowleaf cottonwood (*Populus angustifolia*)	100	8	3-13
SHRUBS			
Mountain alder (*Alnus incana*)	100	45	40-50
Red-osier dogwood (*Cornus sericea*)	100	3	--
Wood's rose (*Rosa woodsii*)	100	2	1-3
Big sagebrush (*Artemisia tridentata*)	100	tr	tr-1
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	100	2	tr-3
Blue wildrye (*Elymus glaucus*)	100	tr	tr-1
PERENNIAL FORBS			
Western clematis (*Clematis ligusticifolia*)	100	20	--
Stinging nettle (*Urtica dioica*)	100	tr	tr
ANNUAL GRASSES and FORBS			
Cheatgrass (*Bromus tectorum*)	100	2	tr-3

Successional Dynamics

So long as the alluvial bars on which this association occurs are flooded and disturbed by debris scour and deposition, narrowleaf cottonwood and mountain alder seedlings can become established. Seeds are distributed in the spring and contain little endosperm. Once germinated they must have adequate moisture until the root radical can reach the water table below the surface of the bar. Narrowleaf cottonwood can also establish through the dispersal and subsequent rooting of branchlets and the burial of branches by debris. As the stream course changes and streambanks develop into floodplains and eventually terraces, the vegetation will change over decades from narrowleaf cottonwood-dominated to sagebrush-dominated. Older narrowleaf cottonwood trees may survive some low or moderate intensity fires due to its thick bark. Young and middle-aged plants would be killed by any fire on the site. Mountain alder will resprout vigorously from root crowns.

Adjacent Vegetation

The upland vegetation zone in which this association occurs is sagebrush steppe

Other Studies Documenting Association with Plot Data
Colorado: Kittel *et al.* 1999

Populus angustifolia/Cornus sericea ssp. sericea/Clematis ligusticifolia Association

Narrowleaf cottonwood/Red-osier dogwood/Western clematis Association
3 plots. CEGL002664 = *Populus angustifolia/Cornus sericea*.

Ecoregional Range
BR

Environment and Soils

The Narrowleaf cottonwood/Red-osier dogwood/Western clematis Association is found in at moderate elevations in the Basin and Range Ecoregion. Sites are sandy to rocky floodplains in east-facing, high gradient, narrow, V- and trough-shaped valleys with moderately steep to steep sideslopes. Rosgen stream types are A2 and A3. This association is found on stream orders 1 and 2.

Valley Environment	Average	Range
Elevation (ft)	4567	4420-4800
Plot Slope (%)	6	--
Valley Width (m)	35	20-65
Valley Gradient (%)	9	7-10
Valley Sideslopes (%)	62	45-70
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	22	15-30
Gravel	4	tr-5
Rock	15	tr-25
Cryptogam	2	tr-5
Litter	58	45-80

Vegetation Composition

Narrowleaf cottonwood forms a dense tree layer over a mixed shrub understory in which red-osier dogwood is the prominent component. Other shrubs found on all sample sites include arroyo willow, Wood's rose and big sagebrush. MacKenzie's willow may also form high cover on some sites. Western clematis is the dominant herbaceous species with Kentucky bluegrass, blue wildrye and starry false-Solomon's seal occurring on all sites. A variety of graminoids and forbs comprise the remaining scattered herbaceous layer. Mean percent cover is 176, ranging from 148-195. Mean richness is 26, ranging from 18-37.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Narrowleaf cottonwood (*Populus angustifolia*)	100	60	--
TREE UNDERSTORY			
Narrowleaf cottonwood (*Populus angustifolia*)	100	15	13-20
SHRUBS			
Red-osier dogwood (*Cornus sericea*)	100	24	3-60
Arroyo willow (*Salix lasiolepis*)	100	11	1-20
Wood's rose (*Rosa woodsii*)	100	8	3-13
Big sagebrush (*Artemisia tridentata*)	100	2	1-3
MacKenzie's willow (*Salix prolixa*)	67	12	3-20
Mountain alder (*Alnus incana*)	67	6	3-8
Common chokecherry (*Prunus virginiana*)	67	2	tr-3
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	100	8	3-13
Blue wildrye (*Elymus glaucus*)	100	tr	tr-1
PERENNIAL FORBS			
Western clematis (*Clematis ligusticifolia*)	100	23	20-30
Starry false Solomon's seal (*Smilacina stellata*)	100	3	1-8
Dandelion (*Taraxacum officinale*)	67	tr	--
Yarrow (*Achillea millefolium*)	67	tr	--
Canada thistle (*Cirsium arvense*)	67	tr	--
FERNS and HORSETAILS			
Common scouring Rush (*Equisetum hyemale*)	67	1	--
ANNUAL GRASSES and FORBS			
Cheatgrass (*Bromus tectorum*)	100	2	1-3
Yellow salsify (*Tragopogon dubius*)	100	tr	--
Bull thistle (*Cirsium vulgare*)	67	tr	--

Adjacent Vegetation

The upland vegetation zone in which this association occurs is sagebrush steppe.

Successional Dynamics

So long as the alluvial bars on which this association occurs are flooded and disturbed by debris scour and deposition, narrowleaf cottonwood and red-osier dogwood seedlings can become established. Seeds are distributed in the spring and contain little endosperm. Once germinated they must have adequate moisture until the root radical can reach the water table below the surface of the bar. Narrowleaf cottonwood can also establish through the dispersal and subsequent rooting of branchlets and the burial of branches by debris.

As the stream course changes and streambanks develop into floodplains and eventually terraces, the vegetation will change over decades from narrowleaf cottonwood-dominated to sagebrush-dominated.

Older narrowleaf cottonwood trees may survive some low or moderate intensity fires due to its thick bark. Young and middle-aged plants would be killed by any fire on the site. Red-osier dogwood will resprout vigorously from root crowns.

Other Studies Documenting Association with Plot Data

Nevada: Manning and Padgett (1995) describe a *Populus/Cornus stolonifera* Community Type that includes *Populus angustifolia/Cornus sericea* ssp. *sericea* stands
Utah and southeastern Idaho: Padgett *et al.* 1989
Colorado: Kittel *et al.* 1999
Montana: Hansen *et al.* 1995
South Dakota: Marriot and Faber-Langendoen 2000

Alnus rhombifolia-Alluvial Bar Association

White alder – Alluvial bar Association
14 plots. CEGL00629.

Ecoregional Range

BM, BR, CB

Environment and Soils

The White alder-Alluvial bar Assocation is widespread at low elevations in the Columbia Basin, High Plains, Blue Mountains, and Basin and Range Ecoregions. It occurs on fresh deposits of alluvial cobbles and gravels forming streambanks and alluvial bars. Valleys are moderate to high gradient, narrow to wide, box- and trough-, V- and flat-shaped with gentle to steep sideslopes. Valley aspects are variable. Adjacent Rosgen stream types are A2, A3, B2, B3 and C3. Soils are fragmental poorly developed Entisols.. This association receives less precipitation, much less annual snowfall and is warmer than the Black cottonwood-Alluvial bar Association.

Valley Environment	Average	Range
Elevation (ft)	1748	720-2880
Plot Slope (%)	3	tr-10
Valley Width (m)	65	20-200
Valley Gradient (%)	5	2-10
Valley Sideslopes (%)	52	15-70
Local Climate		
Mean Annual Precipitation (in.)	12	10-14
Mean Annual Snowfall (in.)	16	12-23
Mean Annual Temperature (F)	50	48-53
Mean Minimum Temperature (F)	37	33-41
Mean Maximum Temperature (F)	62	60-65
Median Date of Last Spring Freeze	May 23	April 26-June 12
Median Date of First Fall Freeze	Sep. 27	Sep. 10-Oct. 13
Soil Surface Cover (%)		
Submerged	2	0-6
Bare Ground	13	0-25
Gravel	13	5-40
Rock	40	10-70
Cryptogam	2	0-10
Litter	28	tr-80

Vegetation Composition

White alder forms a dense overstory canopy. Various shrubs occur in scattered, sparse cover in the shrub layers, including Lewis' mockorange, coyote willow, poison ivy, blue elderberry, western serviceberry and Wood's rose. The herbaceous layer is also sparse. The most constantly occurring plants are threesquare bulrush, creeping spikerush, blue wildrye, common horsetail, reed canarygrass, western clematis, stinging nettle, curly dock and cocklebur.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
White alder (*Alnus rhombifolia*)	100	74	50-98
TREE OVERSTORY-SUBDOMINANTS			
White alder (*Alnus rhombifolia*)	14	20	--
TREE UNDERSTORY			
White alder (*Alnus rhombifolia*)	29	2	tr-5
SHRUBS			
Lewis' mockorange (*Philadelphus lewisii*)	43	3	tr-6
Coyote willow (*Salix exigua*)	36	2	tr-3
SEDGES and RUSHES			
Threesquare bulrush (*Schoenoplectus americanus*)	43	1	tr-3
Creeping spikerush (*Eleocharis palustris*)	36	2	tr-3
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	43	1	tr-3
Reed canarygrass (*Phalaris arundinacea*)	36	2	tr-3
PERENNIAL FORBS			
Western clematis (*Clematis ligusticifolia*)	64	1	tr-3
Stinging nettle (*Urtica dioica*)	57	2	tr-3
Curly dock (*Rumex crispus*)	43	tr	--
Rough cocklebur (*Xanthium strumarium*)	43	tr	--
Yellow monkeyflower (*Mimulus guttatus*)	36	tr	tr-1
Field mint (*Mentha arvensis*)	36	tr	tr
Water speedwell (*Veronica analgallis-aquatica*)	36	tr	tr
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	71	tr	tr-1
ANNUAL GRASSES and FORBS			
Cheatgrass (*Bromus tectorum*)	50	3	tr-15

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are:
sideslopes – big sagebrush/perennial bunchgrass associations, western juniper associations and Idaho fescue-bluebunch wheatgrass

Successional Dynamics

This association may be the latest successional association on the fluvial surfaces on which it occurs, namely frequently flooded (probably every spring) and geomorphically disturbed sites that receive fresh deposits of sediments. Under these conditions white alder seedlings can become established. Once germinated they must have adequate moisture until the root radical can reach the water table below the surface of the bar.

Fires are probably infrequent in this association because of the high moisture content of the vegetation. White alder plants are not resistant to fire and will be killed by even low intensity fires.

Other Studies Documenting Association with Plot Data

Idaho: Miller 1976

Alnus rhombifolia/Carex nudata Association

White alder/Torrent sedge Association
3 plots. New type

Ecoregional Range
BM, CB

Environment and Soils
The White alder/Torrent sedge Association is found at low elevations in the Blue Mountains and Columbia Basin Ecoregions. Sites are streambanks in northeast facing, moderate gradient, narrow to wide, box canyons with steep sideslopes. Adjacent Rosgen stream types are C3 and F2.

Valley Environment	Average	Range
Elevation (ft)	1193	525-2400
Plot Slope (%)	2	--
Valley Width (m)	140	20-200
Valley Gradient (%)	2	--
Valley Sideslopes (%)	70	--

Vegetation Composition
White alder forms a dense overstory over scattered torrent sedge and sparse shrubs. The remaining herbaceous layer is variable, consisting of small amounts of graminoids and forbs.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
White alder (*Alnus rhombifolia*)	100	85	--
SHRUBS			
Lewis' mockorange (*Philadelphus lewisii*)	100	2	tr-3
Wood's rose (*Rosa woodsii*)	67	tr	--
Golden currant (*Ribes aureum*)	67	tr	--
SEDGES and RUSHES			
Torrent sedge (*Carex nudata*)	100	15	--
PERENNIAL GRASSES			
Reed canarygrass (*Phalaris arundinacea*)	67	3	--
Great Basin wildrye (*Elymus cinereus*)	67	2	tr-3
PERENNIAL FORBS			
Western goldenrod (*Solidago occidentalis*)	67	2	1-3
Western clematis (*Clematis ligusticifolia*)	67	tr	--
Curly dock (*Rumex crispus*)	67	tr	--
Prairie sage (*Artemisia ludoviciana*)	67	tr	--
Stinging nettle (*Urtica dioica*)	67	tr	--
Meadow goldenrod (*Solidago canadensis*)	67	tr	--
ANNUAL GRASSES and FORBS			
Common mullein (*Verbascum thapsus*)	100	tr	--

Adjacent Vegetation
The upland vegetation zone in which this association occurs is western juniper.

Other Studies Documenting Association
none

Alnus rhombifolia/Philadelphus lewisii Association

White alder/Lewis' mockorange Association
15 plots. CEGL000634

Ecoregional Range
BM, BR, CB

Environment and Soils

The White alder/Lewis' mockorange Association occurs at low elevations in the Blue Mountains, Columbia Basin and the eastern Northern Basin and Range Ecoregions. Geomorphic surfaces on which this association occurs are streambanks, alluvial bars and incipient floodplains along Rosgen A1, A2, A3, B3 and B4 stream types. Valleys are moderate to high gradient, narrow to moderately wide and V- and trough-shaped with moderately steep to steep sideslopes. Valley aspects are all but west. Soils are undeveloped cobble and boulder-rich alluvium. Local climate for this association is drier and less snowy (although temperatures are similar) than the Black cottonwood/Lewis' mockorange Association.

Valley Environment	Average	Range
Elevation (ft)	1985	1400-2640
Plot Slope (%)	8	1.5-30
Valley Width (m)	32	5-65
Valley Gradient (%)	7	2-10
Valley Sideslopes (%)	57	45-70
Local Climate		
Mean Annual Precipitation (in.)	18	13-28
Mean Annual Snowfall (in.)	33	15-72
Mean Annual Temperature (F)	48	45-50
Mean Minimum Temperature (F)	37	32-40
Mean Maximum Temperature (F)	60	56-61
Median Date of Last Spring Freeze	May 25	May 10-June 18
Median Date of First Fall Freeze	Sep. 25	Sep. 3-Oct. 6
Soil Characteristics		
Depth to 30% Coarse Fragments (cm)	2	0-5
Depth to 80% Coarse Fragments (cm)	32	0-90
Soil Surface Cover (%)		
Submerged	2	0-10
Bare Ground	4	0-20
Gravel	5	0-10
Rock	32	1-60
Cryptogam	4	0-10
Litter	52	7-92

Vegetation Composition

White alder forms a dense overstory with very little understory regeneration. Although a wide variety of shrubs may be present on sites at very low cover, Lewis' mockorange is the obvious dominant and generally fairly abundant. Herbaceous species are sparse, the most constant being, stinging nettle, chervil, Dewey's sedge, blue wildrye, cleavers and miner's lettuce. Average height of herbaceous layer is 31 cm. Average herbaceous biomass is 128 lbs/acre.

Successional Dynamics

Sites are alluvial bars that are young deposits of cobble-rich sediment. So long as the alluvial bars on which this association occurs are flooded and disturbed by debris scour and deposition, white alder seedlings can become established. The streams on which this association occurs generally are high gradient, high bedload carrying streams. If they are deeply incised in valleys they are unlikely to change course, but will often downcut, eroding and redepositing sediments on a fairly frequent basis, that is on perhaps 20-30 year cycles. Under these conditions, this association is late seral on the site on which it occurs.

Fires are probably infrequent in this association because of the high moisture content of the vegetation. White alder plants are not resistant to fire and will be killed by even low intensity fires. Lewis' mockorange and other shrubs in this association will resprout from rhizomes and/or root crowns if topkilled by fire.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
White alder (*Alnus rhombifolia*)	100	67	10-95
TREE OVERSTORY-SUBDOMINANTS			
White alder (*Alnus rhombifolia*)	40	24	1-60
TREE UNDERSTORY			
White alder (*Alnus rhombifolia*)	33	5	tr-20
SHRUBS			
Lewis' mockorange (*Philadelphus lewisii*)	100	44	11-90
Common chokecherry (*Prunus virginiana*)	47	5	tr-15
Poison ivy (*Toxicodendron rydbergii*)	40	2	tr-3
SEDGES and RUSHES			
Dewey's sedge (*Carex deweyana*)	47	tr	tr-2
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	53	2	tr-3
PERENNIAL FORBS			
Stinging nettle (*Urtica dioica*)	80	2	tr-3
Chervil (*Anthriscus scandicina*)	73	13	tr-40
Climbing nightshade (*Solanum dulcamara*)	27	7	tr-20
Common cowparsnip (*Heracleum lanatum*)	27	2	1-3
Mountain sweet cicily (*Osmorhiza chilensis*)	27	2	tr-5
Yellow monkeyflower (*Mimulus guttatus*)	27	tr	--
Teasel (*Dipsacus sylvestris*)	27	tr	--
ANNUAL GRASSES and FORBS			
Cleavers (*Galium aparine*)	73	7	tr-50
Miners lettuce (*Montia perfoliata*)	60	15	tr-50

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
terraces – Douglas fir/Lewis' mockorange, grand fir association (one site)
sideslopes – Ponderosa pine associations, sagebrush steppe, Idaho fescue-bluebunch wheatgrass, grand fir associations (one site)

Other Studies Documenting Association with Plot Data
Washington: Crawford 2001
Idaho: Miller 1976; Moseley 1998: 19; Jankovsky-Jones *et al.* 2001; Holmstead 2001

Other Studies Documenting Association without Plot Data
Oregon: Evans 1989: 11

Alnus rhombifolia/Celtis laevigata var. reticulata Association

White alder/Netleaf hackberry Association
3 plots. CEGL000633

Valley Environment	Average	Range
Elevation (ft)	868	750-985
Plot Slope (%)	3	2-3.5
Valley Width (m)	95	20-200
Valley Gradient (%)	3	2-5
Valley Sideslopes (%)	53	45-70
Local Climate		
Mean Annual Precipitation (in.)	14	12-16
Mean Annual Snowfall (in.)	18	17-18
Mean Annual Temperature (F)	50	49-50
Mean Minimum Temperature (F)	38	37-39
Mean Maximum Temperature (F)	61	--
Median Date of Last Spring Freeze	May 17	May 10-May 23
Median Date of First Fall Freeze	Oct. 3	Sep. 30-Oct. 5

Ecoregional Range
BM, CB?

Environment and Soils
This association occurs mainly on the Snake River in the Blue Mountains Ecoregion and sporadically on the lower Deschutes River in the Columbia Basin Ecoregion. Sites are streambanks and floodplains along Rosgen B3, G3 and F1 streams. Valleys are north-facing, moderate gradient, narrow to wide box-, V- and trough-shaped with moderately steep to steep sideslopes.

Vegetation Composition
White alder forms an open to dense canopy over netleaf hackberry and Lewis' mockorange. Other shrubs occur at low cover, including common chokecherry, poison ivy and oak, blue elderberry, cascara, Wood's rose and currants. Herbaceous species are sparse.

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are: sideslopes – sagebrush steppe, Idaho fescue-bluebunch wheatgrass

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
White alder (*Alnus rhombifolia*)	67	52	38-65
TREE OVERSTORY-SUBDOMINANTS			
White alder (*Alnus rhombifolia*)	67	34	5-63
TREE UNDERSTORY			
White alder (*Alnus rhombifolia*)	33	15	--
SHRUBS			
Netleaf hackberry (*Celtis laevigata* var. *reticulata*)	100	18	15-25
Lewis' mockorange (*Philadelphus lewisii*)	100	19	3-40
Common chokecherry (*Prunus virginiana*)	67	3	tr-5
PERENNIAL FORBS			
Stinging nettle (*Urtica dioica*)	67	2	tr-4
Western clematis (*Clematis ligusticifolia*)	67	2	tr-3
ANNUAL GRASSES and FORBS			
Cleavers (*Galium aparine*)	67	9	3-15
Miners lettuce (*Montia perfoliata*)	67	5	tr-10

Successional Dynamics
This association is probably the result of a disturbance event. It is likely that the a Netleaf hackberry stand was established on these sites and that a subsequent fluvial depositional or erosional event occurred after which the white alder was established. Thus communities may succeed over decades back to a hackberry-dominated association. Or it the sites are subject to more flooding, the white alder may be persistent.

Other Studies Documenting Association with Plot Data
Idaho: Miller 1976
Washington: Crawford 2001

Alnus rhombifolia/Cornus sericea ssp. sericea Association

White alder/Red-osier dogwood Association
8 plots. New type

Valley Environment	Average	Range
Elevation (ft)	1688	800-2560
Plot Slope (%)	3.4	1.5-10
Valley Width (m)	80	20-200
Valley Gradient (%)	4	2-10
Valley Sideslopes (%)	44	15-70
Local Climate		
Mean Annual Precipitation (in.)	15	12-18
Mean Annual Snowfall (in.)	26	19-36
Mean Annual Temperature (F)	48	45-50
Mean Minimum Temperature (F)	36	35-38
Mean Maximum Temperature (F)	59	54-62
Median Date of Last Spring Freeze	May 24	May 12-May 30
Median Date of First Fall Freeze	Sep. 27	Sep. 23-Oct. 5
Soil Surface Cover (%)		
Submerged	3	0-10
Bare Ground	3	0-5
Gravel	1	0-5
Rock	27	0-75
Cryptogam	18	tr-39
Litter	46	15-88

Ecoregional Range
BM, CB, EC

Environment and Soils
The White alder/Red-osier dogwood Association occurs at low elevations in the Blue Mountains, Columbia Basin and northern East Cascades Ecoregions, mainly along the Snake and Deshutes Rivers and Mill Creek. Geomorphic sites are streambanks and floodplains. Valleys are mostly southeast- and northeast-facing, moderate gradient, narrow to moderately wide and V-, box- and trough-shaped with gentle to steep sideslopes. Associated Rosgen stream types are B2, B3.

Vegetation Composition
The overstory tree layer is dominated by white alder. Other tree species occurring occasionally are Douglas fir, black cottonwood, bigleaf maple and white oak. Red-osier dogwood and Lewis' mockorange are constants in the shrub overstory. Wood's rose, cascara, black hawthorn, poison ivy, common snowberry and thimbleberry are also present in varying amounts. The common herbaceous species in this association indicate fairly frequent site disturbance and include western clematis, stinging nettle, chickweed, climbing nightshade, Fendler's waterleaf and blue wildrye. Average herbaceous biomass is 240 lbs/acre, ranging from 192 to 288 lbs/acre.

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
sideslopes – Idaho fescure-bluebunch wheatgrass, ponderosa pine associations, Douglas fir associations

Successional Dynamics
So long as the alluvial bars on which this association occurs are flooded and disturbed by debris scour and deposition, white alder seedlings can become established. Sites are floodplains and streambanks composed of cobble-rich sediment. If the stream course changes and/or the streambed downcuts, the streambanks and floodplains may eventually develop into terraces. Concurrent with this process of site succession, the vegetation will change over decades from white alder-dominated Ponderosa pine or Douglas fir-dominated, depending upon the associated upland vegetation in the zone in which the site occurs.

Fires are probably infrequent in this association because of the high moisture content of the vegetation. White alder plants are not resistant to fire and will be killed by even low intensity fires. The characteristic shrubs will resprout from rhizomes or root crowns following topkill by fire.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
White alder (*Alnus rhombifolia*)	100	44	15-70
TREE OVERSTORY-SUBDOMINANTS			
White alder (*Alnus rhombifolia*)	25	15	10-20
TREE UNDERSTORY			
White alder (*Alnus rhombifolia*)	25	11	7-15
SHRUBS			
Red-osier dogwood (*Cornus sericea*)	100	28	15-50
Lewis' mockorange (*Philadelphus lewisii*)	100	13	3-40
Wood's rose (*Rosa woodsii*)	63	2	tr-3
Cascara (*Rhamnus purshiana*)	50	6	3-10
Black hawthorn (*Crataegus douglasii*)	50	3	tr-7
Poison ivy (*Toxicodendron rydbergii*)	50	3	tr-5
Common snowberry (*Symphoricarpos albus*)	38	14	tr-38
Thimbleberry (*Rubus parviflorus*)	38	13	tr-30
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	38	1	tr-3
PERENNIAL FORBS			
Western clematis (*Clematis ligusticifolia*)	50	4	tr-10
Stinging nettle (*Urtica dioica*)	38	7	2-15
Chickweed (*Stellaria media*)	38	1	tr-2
Climbing nightshade (*Solanum dulcamara*)	38	tr	tr-1
Fendler's waterleaf (*Hydrophyllum fendleri*)	38	tr	--
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	88	4	tr-20
Common scouring rush (*Equisetum hyemale*)	50	15	tr-60
Ladyfern (*Athyrium filix-femina*)	38	4	tr-6
ANNUAL GRASSES and FORBS			
Miners lettuce (*Montia perfoliata*)	50	1	tr-2
Cleavers (*Galium aparine*)	38	1	tr-3

Other Studies Documenting Association

none

Alnus rhombifolia / Betula occidentalis Association

White alder/Water birch Association
3 plots. CEGL000632

Ecoregional Range
BM, BR, CB

Valley Environment	Average	Range
Elevation (ft)	2507	2000-3280
Plot Slope (%)	3	2-4
Valley Width (m)	35	20-65
Valley Gradient (%)	3	2-5
Valley Sideslopes (%)	53	45-70
Local Climate		
Mean Annual Precipitation (in.)	14	13-14
Mean Annual Snowfall (in.)	25	16-34
Mean Annual Temperature (F)	47	44-48
Mean Minimum Temperature (F)	34	31-36
Mean Maximum Temperature (F)	59	58-61
Median Date of Last Spring Freeze	June 4	May 25-June 11
Median Date of First Fall Freeze	Sep. 19	Sep. 13-Sep. 24

Environment and Soils

The White alder/Western birch Association occurs on white alder-dominated sites that have become more geomorphically stable (Miller 1976). It occurs at low elevations in the Blue Mountains, Columbia Basin, and Basin and Range Ecoregions. Sites are streambanks and floodplains adjacent to Rosgen B2 and B3 stream types. Valleys are north- and northeast-facing, moderate gradient, narrow to moderately wide and B-, box- and trough-shaped with moderately steep to steep sideslopes.

Vegetation Composition

The tree overstory is white alder. Western birch forms a high shrub layer over Lewis' mockorange, Wood's rose, western serviceberry and on one site a mix of black hawthorn, red-osier dogwood, poison ivy, cascara and thimbleberry. Herbaceous species include chervil, stinging nettle, climbing nightshade and common scouring rush.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
White alder (*Alnus rhombifolia*)	67	57	50-63
TREE OVERSTORY-SUBDOMINANTS			
White alder (*Alnus rhombifolia*)	67	12	4-20
TREE UNDERSTORY			
White alder (*Alnus rhombifolia*)	33	3	--
SHRUBS			
Water birch (*Betula occidentalis*)	100	45	15-70
Wood's rose (*Rosa woodsii*)	100	6	tr-15
Lewis' mockorange (*Philadelphus lewisii*)	67	15	--
Western serviceberry (*Amelanchior alnifolia*)	67	3	tr-5
PERENNIAL FORBS			
Chervil (*Anthriscus scandicina*)	67	13	10-15
Stinging nettle (*Urtica dioica*)	67	3	2-3
Climbing nightshade (*Solanum dulcamara*)	67	1	tr-2
FERNS and HORSETAILS			
Common scouring Rush (*Equisetum hyemale*)	67	tr	--

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are:
terraces – ponderosa pine associations
sideslopes – Idaho fescue-bluebunch wheatgrass, big sagebrush/perennial bunchgrass

Successional Dynamics

Western birch is relatively long-lived and persistent on stable sites. Birch seedlings need bare, moist mineral substrate and also shade for 2-3 months during their first summer and thus are probably established infrequently on sites of fine-textured deposition on established floodplains.

Fires will topkill western birch plants. The plants may resprout from basal buds following fires. White alder will be topkilled by fires but can resprout from root suckers. Following fire, middle and understory shrubs will resprout from rhizomes and/or root crowns.

Other Studies Documenting Association with Plot Data

Washington: Crawford 2001
Idaho: Miller 1976; Holmstead 2001

Alnus rhombifolia/Crataegus douglasii Association

White alder/Black hawthorn Association
2 plots. New type

Ecoregional Range

BM, CB

Environment and Soils

The White alder/Black hawthorn Association was sampled at low elevations in the Blue Mountains Ecoregion but may also occur in the Basin and Range and Columbia Basin Ecoregions. Geomorphic surfaces are streambanks along Rosgen A3 stream types. Valleys are northeast-facing moderate to high gradient, narrow and V- and trough-shaped with moderately steep to steep sideslopes. Soils are coarse-fragment rich Entisols. Average annual precipitation and snowfall are lower and temperatures are somewhat higher than for the Black cottonwood/Black hawthorn Association.

Valley Environment	Average	Range
Elevation (ft)	1575	1470-1680
Plot Slope (%)	7	3-10
Valley Width (m)	43	20-65
Valley Gradient (%)	8	5-10
Valley Sideslopes (%)	58	45-70
Local Climate		
Mean Annual Precipitation (in.)	14	13-16
Mean Annual Snowfall (in.)	23	20-27
Mean Annual Temperature (F)	48	47-50
Mean Minimum Temperature (F)	37	--
Mean Maximum Temperature (F)	60	57-62
Median Date of Last Spring Freeze	May 20	May 17-May 22
Median Date of First Fall Freeze	Sep. 27	Sep 26-Sep. 27
Soil Surface Cover (%)		
Submerged	8	0-15
Bare Ground	tr	0-1
Gravel	6	2-10
Rock	23	5-40
Cryptogam	5	--
Litter	54	25-83

Vegetation Composition

White alder forms a moderately dense canopy over a variety of shrub species. Black hawthorn and Lewis' mockorange dominate the shrub overstory, which averages 6 m in height and also includes blue elderberry and common chokecherry. The shrub understory, averaging 3.7 m in height, comprises poison ivy and snow gooseberry. Chervil dominates the herbaceous layer, which averages 31 cm in height and also includes stinging nettle, cleavers, Miner's lettuce, common scouring rush and blue wildrye. Biomass averages 800 lbs/acre.

Successional Dynamics

Fires are probably infrequent in this association because of the high moisture content of the vegetation. White alder plants are not resistant to fire and will be killed by even low intensity fires. All shrubs in this association will resprout from rhizomes and/or root crowns if topkilled by fire.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
White alder (*Alnus rhombifolia*)	100	38	25-50
TREE OVERSTORY-SUBDOMINANTS			
White alder (*Alnus rhombifolia*)	50	20	--
SHRUBS			
Lewis' mockorange (*Philadelphus lewisii*)	100	45	40-50
Black hawthorn (*Crataegus douglasii*)	100	20	--
Poison ivy (*Toxicodendron rydbergii*)	100	15	tr-30
Blue elderberry (*Sambucus cerulea*)	100	5	--
Common chokecherry (*Prunus virginiana*)	100	3	1-5
Netleaf hackberry (*Celtis laevigata* var. *reticulata*)	100	2	--
Snow gooseberry (*Ribes niveum*)	100	1	tr-2
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	100	tr	tr-1
PERENNIAL FORBS			
Chervil (*Anthriscus scandicina*)	100	45	20-70
Stinging nettle (*Urtica dioica*)	100	3	1-4
FERNS and HORSETAILS			
Common scouring Rush (*Equisetum hyemale*)	100	tr	tr-1
ANNUAL GRASSES and FORBS			
Cheatgrass (*Bromus tectorum*)	100	3	1-4
Cleavers (*Galium aparine*)	100	12	3-20
Miners lettuce (*Montia perfoliata*)	100	8	tr-15

Adjacent Vegetation
The upland vegetation zone in which this association occurs is Idaho fescues-bluebunch wheatgrass.

Other Studies Documenting Association
none

Alnus rhombifolia / Acer circinatum Association

White alder/Vine maple Association
3 plots. New type

Ecoregional Range
EC

Environment and Soils
This association is located in very northern portion of East Cascades Ecoregion. It was sampled on South Fork Mill Creek, a tributary to the Columbia River. Sites are streambanks in east-facing, moderate gradient, narrow, V-shaped valleys with moderately steep sideslopes. Adjacent Rosgen stream types are B3.

Valley Environment	Average	Range
Elevation (ft)	993	900-1100
Plot Slope (%)	2	1.5-3
Valley Width (m)	50	20-65
Valley Gradient (%)	2	--
Valley Sideslopes (%)	45	--
Local Climate		
Mean Annual Precipitation (in.)	18	18-19
Mean Annual Snowfall (in.)	31	28-31
Mean Annual Temperature (F)	49	49-50
Mean Minimum Temperature (F)	38	--
Mean Maximum Temperature (F)	61	--
Median Date of Last Spring Freeze	May 13	May 12-May 14
Median Date of First Fall Freeze	Oct 5	--

Vegetation Composition

White alder dominates the overstory that also contains scattered Douglas fir and bigleaf maple. The shrub layer comprises mainly vine maple and Lewis' mockorange with scattered red-osier dogwood, holly-leaved barberry, thimbleberry, California blackberry, common snowberry, Wood's rose and beaked hazelnut. Herbaceous species are sparse.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
White alder (*Alnus rhombifolia*)	100	39	15-63
TREE OVERSTORY-SUBDOMINANTS			
Douglas fir (*Pseudotsuga menziesii*)	67	9	3-15
Bigleaf maple (*Acer macrophyllum*)	67	2	tr-3
TREE UNDERSTORY			
Douglas fir (*Pseudotsuga menziesii*)	67	tr	--
Bigleaf maple (*Acer macrophyllum*)	67	tr	--
SHRUBS			
Vine maple (*Acer circinatum*)	100	30	15-38
Lewis' mockorange (*Philadelphus lewisii*)	100	23	15-38
Red-osier dogwood (*Cornus sericea*)	100	6	tr-15
Hollyleaved barberry (*Berberis aquifolium*)	100	5	tr-15
Wood's rose (*Rosa woodsii*)	100	5	tr-15
Thimbleberry (*Rubus parviflorus*)	100	2	tr-3
California blackberry (*Rubus ursinus*)	100	2	tr-3
Common snowberry (*Symphoricarpos albus*)	67	38	--
Beaked hazelnut (*Corylus cornuta*)	67	9	3-15
PERENNIAL FORBS			
Cooley's hedgenettle (*Stachy cooleyae*)	67	2	tr-3
Mountain sweet cicily (*Osmorhiza chilensis*)	67	tr	--
Feathery Solomonplume (*Smilacina racemosa*)	67	tr	--
Bride's feathers (*Aruncus sylvester*)	67	tr	--
FERNS and HORSETAILS			
Brittle bladderfern (*Cystopteris fragilis*)	67	tr	--
Ladyfern (*Athyrium filix-femina*)	67	tr	--

Adjacent Vegetation

The upland vegetation zone in which this association occurs is white oak woodland.

Other Studies Documenting Association

none

MID ELEVATION TREE ASSOCIATIONS

Abies grandis/Athyrium filix-femina Association

Grand fir/Ladyfern Association
4 plots. CEGL00000270

Ecoregional Range
BM

Environment and Soils
The Grand fir/Ladyfern Association is found at moderately low to moderately high elevations in the Blue Mountains Ecoregion. These sites are associated with streambanks and floodplains. V-shaped, moderate to very high gradient, narrow valleys are characteristic of this type. Soils are composed of silt loam or silty clay loams over gravels and cobbles. Mean depth to the buried stream bed is 25 cm. Spring flooding of these sites is followed the water table retreating 30-60 cm by fall. Rosgen stream reach types of B3 and B4 were identified.

Vegetation Composition
Grand fir dominates the multi-storied tree layer. Engelmann spruce is occasionally abundant as a co-dominant species. Shrubs are poorly represented in this type with the exception of occasional, well represented alders - mountain alder occurs at lower elevations and Sitka alder at higher elevations. Lady fern is well represented to abundant with mean coverage of 53%. A diverse group of forbs and grasses are supported on these wet sites. These include: alpine mitrewort, clasping leaf twistedstalk, enchanter's nightshade, western coneflower, one-leaf foamflower, heart-leaved miner's lettuce, stinging nettle, brook saxifrage, trail plant, starry false-Solomon's seal, drooping woodreed, and Columbia brome. Average height of the shrub overstory is 4.6 m. Average height of the shrub understory is 3.1 m. Average height of the herbaceous layer is 31 cm. Average herbaceous biomass is 1293 lbs/acre, ranging from 147-2067 lbs/acre.

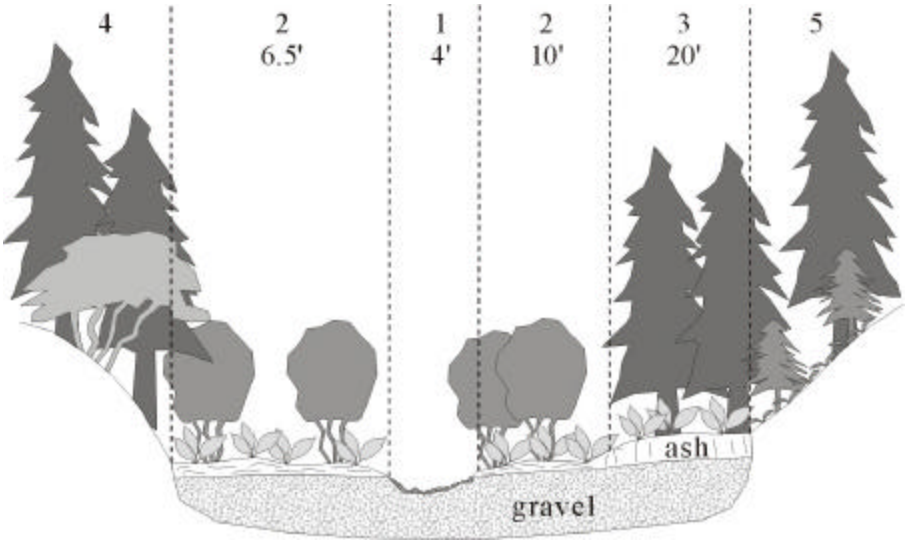
Valley Environment	Average	Range
Elevation (ft)	4445	3780-5150
Plot Slope (%)	12	2-28
Valley Width (m)	13	5-20
Valley Gradient (%)	7	2-10
Valley Sideslopes (%)	50	15-70
Local Climate		
Mean Annual Precipitation (in.)	32	22-44
Mean Annual Snowfall (in.)	97	83-119
Mean Annual Temperature (F)	43	43-44
Mean Minimum Temperature (F)	33	30-35
Mean Maximum Temperature (F)	54	52-56
Median Date of Last Spring Freeze	June 12	June 2-June 29
Median Date of First Fall Freeze	Sep. 11	Aug. 31-Sep. 17
Soil Surface Cover (%)		
Submerged	2	0-8
Bare Ground	2	0-5
Gravel	tr	0-2
Rock	3	0-10
Cryptogam	21	2-70
Litter	71	22-92

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
sideslopes: grand fir/Pacific yew/twinflower or queen's cup beadlily (*Clintonia uniflora*), grand fir/big huckleberry (*Vaccinium membranaceum*), grand fir/Rocky Mountain maple and grand fir/queen's cup beadlily.

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt, mixed, predominantly igneous extrusive
Total Rooting Depth (cm)	avg.: 30; range: 25-46
Depth to 30% Coarse Fragments (cm)	avg.: 24; range: 0-46
Depth to 80% Coarse Fragments (cm)	avg.: 24; range: 0-46
Surface Layer	
Thickness (cm)	5-17
Texture(s)	silt loam, clay loam
Coarse Fragments (%)	0-2, gravel
Roots: very fine	few to many
fine	common to many
medium	none to few
coarse	none to few
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	0-28
Texture(s)	silt loam
Coarse Fragments (%)	0
Roots: very fine	few
fine	few
medium	few
coarse	few
Redoximorphic Features	none
Substrate	gravel, cobble

Illustrations

1 B4 stream reach
2 **Mountain alder/ladyfern**, floodplain
3 **Grand fir/ladyfern**, terrace
4 Grand fir/Rocky Mountain maple, southwest-facing sideslope
5 Grand fir/big huckleberry, northeast-facing sideslope



Dry Creek, Walla Walla RD, Umatilla NF; moderately low gradient, moderately low elevation, Blue Mountains Ecoregion

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Engelmann spruce (*Picea engelmannii*)	25	25	--
Grand fir (*Abies grandis*)	25	15	--
TREE OVERSTORY-SUBDOMINANTS			
Grand fir (*Abies grandis*)	50	40	10-70
TREE UNDERSTORY			
Grand fir (*Abies grandis*)	75	5	tr-12
Engelmann spruce (*Picea engelmannii*)	75	3	1-6
SHRUBS			
Prickly currant (*Ribes lacustre*)	75	4	1-9
Sitka alder (*Alnus viridus* spp. *sinuata*)	50	37	3-70
Mountain alder (*Alnus incana*)	50	15	--
Rocky Mountain maple (*Acer glabrum*)	50	2	1-3
Common snowberry (*Symphoricarpos albus*)	50	1	tr-2
PERENNIAL GRASSES			
Drooping woodreed (*Cinna latifolia*)	100	6	1-13
Columbia brome (*Bromus vulgaris*)	50	2	--
PERENNIAL FORBS			
Alpine mitrewort (*Mitella pentandra*)	100	12	tr-25
Claspleaf twistedstalk (*Streptopus amplexifolius*)	100	9	3-15
Enchanter's nightshade (*Circaea alpina*)	100	4	2-8
Western coneflower (*Rudbeckia occidentalis*)	100	2	1-3
Oneleaf foamflower (*Tiarella trifoliata* var. *unifoliata*)	75	19	4-40
Heart-leaved miner's lettuce (*Claytonia cordifolia*)	75	8	3-15
Stinging nettle (*Urtica dioica*)	75	3	1-7
Brook saxifrage (*Saxifraga odontoloma*)	75	3	1-5
Pathfinder (*Adenocaulon bicolor*)	75	3	tr-6
Stream buttercup (*Ranunculus uncinatus*)	75	1	tr-2
Sweet-scented bedstraw (*Galium triflorum*)	75	1	--
Large-leaf avens (*Geum macrophyllum*)	75	tr	tr-1
Starry false Solomon's seal (*Maianthemum stellata*)	50	7	--
Mountain sweet cicily (*Osmorhiza berteroi*)	50	3	1-5
Hooker's fairy bells (*Disporum hookeri*)	50	3	2-4
Stream violet (*Viola glabella*)	50	3	2-3
False bugbane (*Trautvetteria caroliniensis*)	50	3	2-3
FERNS and HORSETAILS			
Ladyfern (*Athyrium filix-femina*)	100	53	11-90

Successional Dynamics

This association is probably stable and self-perpetuating in species composition with the absence of fire. Moderate fires will kill grand firs, and sites may subsequently be dominated by mountain alder associations until grand fir becomes re-established on the site.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997: 54
Montana: Hansen *et al.* 1995

Abies grandis/Gymnocarpium dryopteris Association

Grand fir/Oakfern Association
8 plots. New type

Ecoregional Range
BM

Environment and Soils
The Grand fir/Oakfern Association occurs at moderate elevations in the northern Blue Mountains Ecoregion along the western slopes of the Blue Mountains. This association is found on floodplains, terraces, and seeps. Sampled sites are in mostly northeast-facing, very narrow to moderate width, moderate to high gradient, generally V-shaped valleys. Soils are predominantly volcanic ash or sandy alluvium over gravels and cobbles. Streamside sites flood seasonally but the water table drops to 0.5 m below the surface in early June. Plots were installed adjacent to Rosgen A2, A3, B3, B4, and F4 stream reach types. Stream widths varied from 1.5 to 15 m.

Vegetation Composition
Grand fir dominates a multi-layered tree overstory with Engelmann spruce commonly associated in these moist habitats. The shrub layer is composed of a variety of moist-site shrubs with irregular occurrences. Prickly currant, bald-hip rose and common snowberry are the most constant species. Western serviceberry, Pacific yew, western thimbleberry and Rocky Mountain maple are occasionally well represented. The understory is characterized by oak fern with a mean canopy coverage of 32%. A rich assemblage of associates includes oneleaf foamflower, starry false-Solomon's seal, false bugbane, sidebells pyrola, sweet-scented bedstraw, queen's cup beadlily, claspleaf twistedstalk, stream violet, Piper's anemone, and lady fern. Height of the shrub overstory averages 3.6 m, ranging from 0.9 to 9.2 m. Height of the shrub understory averages 1.1 m, ranging from 0.9 to 1.2 m. Height of the herbaceous layer average 39 cm, ranging from 31-76 cm. Herbaceous biomass averages 314 lbs/acre, ranging from 124-511 lbs/acre.

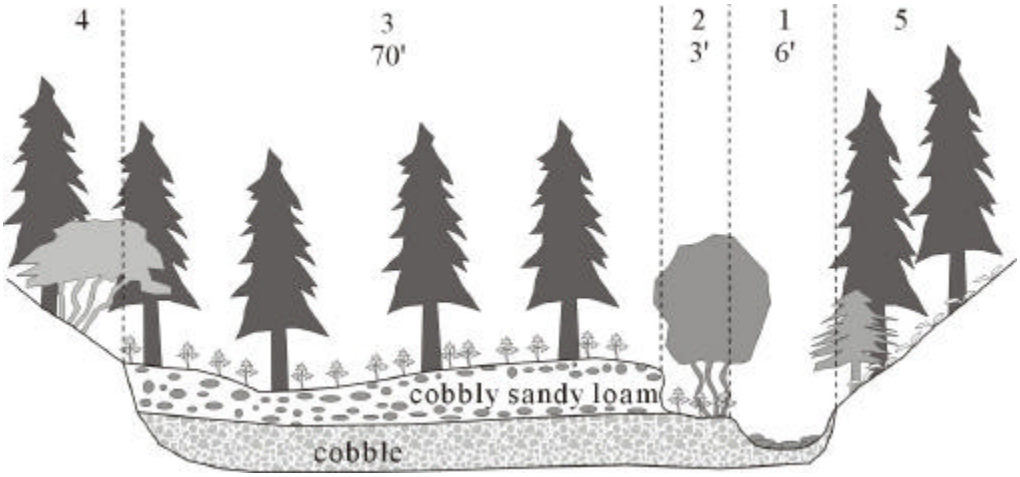
Valley Environment	Average	Range
Elevation (ft)	3783	3230-4160
Plot Slope (%)	7	1-13
Valley Width (m)	31	5-65
Valley Gradient (%)	5	2-10
Valley Sideslopes (%)	49	45-70
Local Climate		
Mean Annual Precipitation (in.)	33	21-45
Mean Annual Snowfall (in.)	77	51-100
Mean Annual Temperature (F)	44	43-45
Mean Minimum Temperature (F)	33	31-34
Mean Maximum Temperature (F)	55	53-56
Median Date of Last Spring Freeze	June 10	May 26-July 2
Median Date of First Fall Freeze	Sep. 13	Aug. 30-Sep. 23
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	-	-
Gravel	-	-
Rock	tr	0-3
Moss	48	17-73
Liverwort	3	0-20
Lichen	2	0-5
Litter	47	24-80

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
Sideslopes: grand fir/oakfern, grand fir/big huckleberry (*Vaccinium membranaceum*), grand fir/Pacific yew/twinflower or queen's cup beadlily and grand fir/Rocky Mountain maple.

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt, rhyolite, ash
Water Table Depth (cm)	avg.: 76; range: 31-100
Total Rooting Depth (cm)	avg.: 17; range: 10-25
Depth to 30% Coarse Fragments (cm)	avg.: 23; range: 0-52
Depth to 80% Coarse Fragments (cm)	avg.: 23; range: 0-52
Surface Layer	
Thickness (cm)	7-18
Texture(s)	organic-rich ash, silty ash, loam, sandy loam
Coarse Fragments (%)	0
Roots: very fine	many
fine	many
medium	few to many
coarse	few to common
Redoximorphic Features	20-30% iron concentrations
Subsurface Layer(s)	
Thickness (cm)	13-42
Texture(s)	silty ash, loam, clay loam, sandy loam, loamy sand
Coarse Fragments (%)	0-10, gravel
Roots: very fine	none to common
fine	none to many
medium	none to many
coarse	few to common
Redoximorphic Features	30-40% iron concentrations
Substrate	ash, ash with 50% gravel

Illustrations

1 A3 stream reach
2 **Mountain alder/oakfern**, floodplain
3 **Grand fir/oakfern**, terrace
4 Grand fir/Rocky Mountain. maple, south-facing sideslope
5 Grand fir/Pacific yew/queen's cup beadlily, north-facing toeslope



Coombs Creek, Pomeroy RD, Umatilla NF; very high gradient, moderately low elevation, V-shaped valley; Blue Mountains Ecoregion

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Grand fir (*Abies grandis*)	75	27	4-60
Engelmann spruce (*Picea engelmannii*)	50	31	3-40
TREE OVERSTORY-SUBDOMINANTS			
Grand fir (*Abies grandis*)	100	14	5-32
Engelmann spruce (*Picea engelmannii*)	13	10	--
TREE UNDERSTORY			
Grand fir (*Abies grandis*)	75	4	tr-8
Engelmann spruce (*Picea engelmannii*)	75	tr	tr-2
SHRUBS			
Prickly currant (*Ribes lacustre*)	100	3	tr-10
Common snowberry (*Symphoricarpos albus*)	88	18	tr-50
Baldhip rose (*Rosa gymnocarpa*)	88	2	tr-4
Twinflower (*Linnaea borealis*)	75	7	tr-20
Pacific yew (*Taxus brevifolia*)	63	26	2-65
Rocky Mountain maple (*Acer glabrum*)	63	8	1-25
Serviceberry (*Amelanchior alnifolia*)	63	2	tr-3
Mountain alder (*Alnus incana*)	50	12	2-35
Thimbleberry (*Rubus parviflorus*)	50	8	tr-30
PERENNIAL FORBS			
Starry false Solomon's seal (*Maianthemum stellata*)	88	6	tr-17
Clasping leaf twistedstalk (*Streptopus amplexifolius*)	88	2	tr-3
Sidebells pyrola (*Orthilia secunda*)	88	tr	tr-2
False bugbane (*Trautvetteria caroliniensis*)	75	17	tr-50
Oneleaf foamflower (*Tiarella trifoliata* var. *unifoliata*)	75	10	tr-35
Queen's cup beadlily (*Clintonia uniflora*)	75	5	tr-10
Sweet-scented bedstraw (*Galium triflorum*)	75	5	tr-20
Pathfinder (*Adenocaulon bicolor*)	75	1	tr-4
Baneberry (*Actaea rubra*)	75	tr	tr-1
Stream violet (*Viola glabella*)	63	2	tr-5
Piper's anenome (*Anemone piperi*)	63	2	tr-5
Woods strawberry (*Fragaria vesca*)	63	tr	tr-1
Roundleaf violet (*Viola orbiculata*)	63	tr	tr-1
FERNS and HORSETAILS			
Oakfern (*Gymnocarpium dryopteris*)	100	32	12-60
Ladyfern (*Athyrium filix-femina*)	100	2	tr-4

Successional Dynamics

Moderate fires will kill grand fir and Engelmann spruce on sites. The other common shrubs and herbs will survive fire and re-sprout or re-seed. Shrub cover will generally become more abundant and will only be reduced when grand fir and Engelmann spruce become re-established on sites and provide heavy shade to the shrub and herbaceous layers below.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997; Johnson and Clausnitzer 1992.

Abies grandis / Trautvetteria caroliniensis Association

Grand fir/False bugbane Association
7 plots. CEGL000285.

Ecoregional Range
BM

Environment and Soils

The Grand fir/False bugbane Association is found at moderate elevations in the northeastern section of the Blue Mountains Ecoregion. Geomorphic surfaces are floodplains in moderate to high gradient, narrow to wide, V- and trough-shaped valleys with gentle to steep sideslopes. Soils are mineral, although an organic or organic-rich surface horizon is often present. Coarse fragments are shallow in the horizon, and the water table is high during the growing season. Adjacent Rosgen stream reach types were A3, A4, B3 and B4.

Valley Environment	Average	Range
Elevation (ft)	4173	3770-4695
Plot Slope (%)	13	3-54
Valley Width (m)	50	5-200
Valley Gradient (%)	6	2-10
Valley Sideslopes (%)	44	15-70
Local Climate		
Mean Annual Precipitation (in.)	32	22-44
Mean Annual Snowfall (in.)	106	64-163
Mean Annual Temperature (F)	43	42-46
Mean Minimum Temperature (F)	33	31-36
Mean Maximum Temperature (F)	53	52-55
Median Date of Last Spring Freeze	June 7	May 30-June 15
Median Date of First Fall Freeze	Sep. 17	Sep. 11-Sep. 22
Soil Characteristics		
Thickness of Surface Organic Layer where present (cm)	10	1-23
Depth to Wet Soil (cm)	15	0-51
Water Table Depth-at time of sampling (cm)	27	24-33
Depth to 30% Coarse Fragments (cm)	15	3-36
Depth to 80% Coarse Fragments (cm)	21	3-36
Soil Surface Cover (%)		
Submerged	2	0-6
Bare Ground	tr	0-2
Gravel	2	0-15
Rock	3	0-15
Moss	28	1-90
Liverwort	tr	0-2
Lichen	1	0-4
Litter	60	tr-99

Vegetation Composition

Grand fir is the tree overstory dominant, although Engelmann spruce can sometimes be co-dominant. Shrub cover is generally sparse, but occasionally a few species may be abundant. False bugbane forms a carpet in the herbaceous understory. Other herbaceous species are scattered, generally at low cover. The most commonly occurring herbs are starry false-Solomon's seal, mountain sweet cicily, stream violet, Wood's strawberry, western meadowrue, sweet-scented bedstraw and heart-leaf arnica. Height of shrub layer averages 1.8 m, ranging from 0.9-3.7 m. Height of the herbaceous layer averages 51 cm, ranging from 31 to 91 cm. Herbaceous biomass averages 223 lbs/acre, ranging from 168-321 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Grand fir (*Abies grandis*)	71	22	5-50
Engelmann spruce (*Picea engelmannii*)	57	20	5-45
TREE OVERSTORY-SUBDOMINANTS			
Grand fir (*Abies grandis*)	86	14	5-40
TREE UNDERSTORY			
Grand fir (*Abies grandis*)	100	9	tr-20
Engelmann spruce (*Picea engelmannii*)	43	tr	tr-1
SHRUBS			
Prickly currant (*Ribes lacustre*)	71	3	1-7
Common snowberry (*Symphoricarpos albus*)	57	5	tr-10
Rocky Mountain maple (*Acer glabrum*)	57	1	tr-3
Twinflower (*Linnaea borealis*)	57	11	tr-35
Serviceberry (*Amelanchior alnifolia*)	43	27	tr-80
Baldhip rose (*Rosa gymnocarpa*)	43	7	tr-20
Stinking swamp currant (*Ribes hudsonianum*)	43	5	tr-10
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	43	7	3-15
Western fescue (*Festuca occidentalis*)	43	2	tr-3
Drooping woodreed (*Cinna latifolia*)	43	1	--
PERENNIAL FORBS			
False bugbane (*Trautvetteria caroliniensis*)	100	43	4-85
Starry false Solomon's seal (*Maianthemum stellata*)	86	5	tr-25
Western meadowrue (*Thalictrum alpinum*)	86	4	tr-10
Stream violet (*Viola glabella*)	86	3	tr-5
Woods strawberry (*Fragaria vesca*)	86	2	tr-10
Mountain sweet cicily (*Osmorhiza berteroi*)	86	2	tr-4
Sweet-scented bedstraw (*Galium triflorum*)	86	1	tr-3
Heart-leaf arnica (*Arnica cordifolia*)	71	15	1-35
Bigleaf sandwort (*Moehringia macrophylla*)	71	3	tr-9
Piper's anenome (*Anemone piperi*)	71	2	tr-3
Sidebells pyrola (*Orthilia secunda*)	71	tr	tr-1
Enchanter's nightshade (*Circaea alpina*)	57	9	1-20
Claspleaf twistedstalk (*Streptopus amplexifolius*)	57	3	tr-6
Alpine mitrewort (*Mitella pentandra*)	57	1	tr-2
FERNS and HORSETAILS			
Ladyfern (*Athyrium filix-femina*)	57	3	1-4

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are grand fir associations.

Successional Dynamics
Moderate fires will kill grand fir and Engelmann spruce on sites. The other common shrubs and herbs will survive fire and re-sprout or re-seed. Shrub cover may become more unless competition from false bugbane plants prevents shrub seedlings from becoming established.

Other Studies Documenting Association with Plot Data
Oregon: Johnson and Clausnitzer 1992

*Abies grandis/Carex pellita Association**

Grand fir/Woolly Sedge Association
1 plot. New type

Ecoregional Range
BM

Environment and Soils
This community was sampled on the edge Frog Heaven Meadows in the Blue Mountains Ecoregion at 3100 feet elevation. The soil profile is composed of sedge peat over silt loam over gravel. The water table was one foot below the surface in mid-August.

Vegetation Composition
Grand fir dominates the stand, but lodgepole pine, western larch, and Douglas fir are also present. Woolly sedge is abundant in the understory with 75% canopy coverage.

Dominant Species	Canopy Cover (%)
TREE OVERSTORY-DOMINANTS	
Lodgepole pine (*Pinus contorta*)	20
Grand fir (*Abies grandis*)	16
Western larch (*Larix occidentalis*)	2
TREE OVERSTORY-SUBDOMINANTS	
Douglas fir (*Pseudotsuga menziesii*)	5
Western larch (*Larix occidentalis*)	2
TREE UNDERSTORY	
Grand fir (*Abies grandis*)	5
Lodgepole pine (*Pinus contorta*)	tr
SHRUBS	
Twinflower (*Linnaea borealis*)	15
Baldhip rose (*Rosa gymnocarpa*)	1
Prickly currant (*Ribes lacustre*)	tr
SEDGES and RUSHES	
Woolly sedge (*Carex pellita*)	75
Smallwing sedge (*Carex microptera*)	23
PERENNIAL GRASSES	
Tall trisetum (*Trisetum canescens*)	10
PERENNIAL FORBS	
Starry false Solomon's seal (*Maianthemum stellata*)	20
Feathery Solomonplume (*Maianthemum racemosa*)	10
Green false hellebore (*Veratrum viride*)	7
Common Self-heal *(Prunella vulgaris)*	5
Mountain thermopsis (*Thermopsis montana*)	4
Broadpetal strawberry (*Fragaria virginiana*)	3

Adjacent Vegetation
Grand fir and Ponderosa pine (*Pinus ponderosa*) associations surround the sampled site.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997

*Pinus monticola/Deschampsia caespitosa Association**

Western white pine/Tufted hairgrass Association
1 plot. CEGL003441

Ecoregional Range
BM

Environment and Soils
One stand in this association was sampled on a narrow floodplain along Indian Creek (north of the Strawberry Mountains Wilderness) in the Blue Mountains Ecoregion. The valley is very narrow, steep (10% slope) and trough-shaped with steep sideslopes. The adjacent Rosgen stream reach is a B3 type. This association is found on stream orders 1 and 2.

Vegetation Composition
stand of western white pine and lodgepole pine. Grand fir is present in the understory layers. Yarrow and tufted hairgrass are well represented in the herbaceous layer.
Total cover is 177% and richness is 18.

Dominant Species	Canopy Cover (%)
TREE OVERSTORY-DOMINANTS	
Western white pine (*Pinus monticola*)	75
TREE OVERSTORY-SUBDOMINANTS	
Grand fir (*Abies grandis*)	11
Western white pine (*Pinus monticola*)	7
TREE UNDERSTORY	
Grand fir (*Abies grandis*)	2
Lodgepole pine (*Pinus contorta*)	1
SHRUBS	
Water birch (*Betula occidentalis*)	6
Twinflower (*Linnaea borealis*)	1
Prince's pine (*Chimaphila umbellata*)	1
SEDGES and RUSHES	
Geyer's sedge (*Carex geyeri*)	3
Singlespike sedge (*Carex scirpoidea*)	1
PERENNIAL GRASSES	
Tufted hairgrass (*Deschampsia caespitosa*)	13
Blue wildrye (*Elymus glaucus*)	10
PERENNIAL FORBS	
Yarrow (*Achillea millefolium*)	25
Sidebells pyrola (*Orthilia secunda*)	6
Red columbine (*Aquilegia formosa*)	2
Gray's licoriceroot (*Ligusticum grayi*)	2
Pinedrops (*Pterospora andromedea*)	1
FERNS and HORSETAILS	
Maidenhair fern (*Adiantum pedatum*)	8

Adjacent Vegetation
Upland vegetation adjacent to the sample site is a dry grand fir association.

Successional Dynamics
This association is probably successional to a grand fir association.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997

Pinus ponderosa-Pinus contorta / Spiraea douglasii-Symphoricarpos albus Association

Ponderosa pine-lodgepole pine/Douglas' spiraea-common snowberry Association
4 plots. New type

Ecoregional Range
EC

Environment and Soils
This association occurs on mesic floodplains at low to moderate elevations in drier upland zones of the East Cascades Ecoregion. All sites have 100% litter cover on the soil surface. Soils are composed of mineral materials with loam to fine sandy loam surface horizons.

Valley Environment	Average	Range
Elevation (ft)	4012	3600-4700
Plot Slope (%)	2	0-3
Valley Gradient (%)	2	1-3
Local Climate		
Mean Annual Precipitation (in.)	15	13-19
Mean Annual Snowfall (in.)	48	39-58
Mean Annual Temperature (F)	46	45-46
Mean Minimum Temperature (F)	32	31-33
Mean Maximum Temperature (F)	59	58-60
Median Date of Last Spring Freeze	June 30	June 27-July 1
Median Date of First Fall Freeze	Sep. 3	Aug. 31-Sep. 6
Soil Characteristics		
Current Water Table Depth (cm)	68	65-70
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	-	-
Gravel	-	-
Rock	-	-
Cryptogam	-	-
Litter	100	--

Vegetation Composition
Ponderosa pine, lodgepole pine and, occasionally, western larch dominate the overstory tree canopy. Both pine species are successfully reproducing in the understory regeneration layer. Douglas spiraea, common snowberry, and occasionally, Wood's rose comprise a dense shrub overstory. The frequent presence of mountain alder, red-osier dogwood and prickly currant are indicative of the seasonally high water tables. Herbaceous species are scattered at low cover. Common forbs include: starry false-Solomon's seal, Menzie's silene, red columbine, yarrow, fireweed and broadpetal strawberry. Graminoids are present at very low cover.

Adjacent Vegetation
Upland vegetation types adjacent to this association are Ponderosa pine associations and lodgepole pine-Ponderosa pine stands.

Successional Dynamics
Moderate intensity fires will kill the lodgepole pine and firs in these stands, leaving the Ponderosa pine and larch to dominate the tree overstory. The associated shrubs and herbaceous species will only be top-killed by fire and will readily re-sprout and/or re-seed afterward. With lack of fire, fir species may become more prevalent.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Ponderosa pine (*Pinus ponderosa*)	75	29	20-37
Western larch (*Larix occidentalis*)	50	35	30-40
Lodgepole pine (*Pinus contorta*)	25	37	--
TREE OVERSTORY-SUBDOMINANTS			
Lodgepole pine (*Pinus contorta*)	75	12	10-15
White fir (*Abies concolor*)	50	9	2-15
Ponderosa pine (*Pinus ponderosa*)	25	15	--
TREE UNDERSTORY			
Lodgepole pine (*Pinus contorta*)	100	3	2-3
Ponderosa pine (*Pinus ponderosa*)	75	2	--
Western juniper (*Juniperus occidentalis*)	75	1	1-2
Quaking aspen (*Populus tremuloides*)	50	3	2-3
SHRUBS			
Douglas' spiraea (*Spiraea douglasii*)	100	54	37-70
Common snowberry (*Symphoricarpos albus*)	100	23	15-30
Wood's rose (*Rosa woodsii*)	100	10	1-20
Mountain alder (*Alnus incana*)	75	4	2-5
Prickly currant (*Ribes lacustre*)	75	3	1-5
Creeping Oregon grape (*Mahonia repens*)	75	2	tr-2
Red-osier dogwood	50	2	--
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	75	3	2-5
Western fescue (*Festuca occidentalis*)	75	3	tr-5
Blue wildrye (*Elymus glaucus*)	75	2	tr-2
PERENNIAL FORBS			
Starry false Solomon's seal (*Maianthemum stellata*)	75	5	2-7
Menzie's silene (*Silene menziesii*)	75	4	tr-5
Red columbine (*Aquilegia formosa*)	75	3	tr-5
Yarrow (*Achillea millefolium*)	75	1	tr-2
Fireweed (*Chamerion angustifolium*)	75	tr	--
Broadpetal strawberry (*Fragaria virginiana*)	75	tr	--
Sweet cicily (*Osmorhiza* spp.)	50	4	3-5
Rough bedstraw (*Galium mexicanum* ssp. *asperrimum*)	50	3	2-7
FERNS and HORSETAILS			
Common scouring Rush (*Equisetum hyemale*)	50	tr	tr-5

Other Studies Documenting Association with Plot Data
Oregon: Kovalchik 1987: 136

Alnus rubra/Physocarpus capitatus Association

Red alder/Pacific ninebark Association
4 plots. CEGL000002 = *Alnus rubra/Physocarpus capitatus-Philadelphus lewesii.*

Ecoregional Range
BM, EC, WC

Environment and Soils

The Red alder/Pacific ninebark Association was sampled at moderately low elevations in the northern portion of the Blue Mountains in the Blue Mountains Ecoregion. The drainages on which red alder are found are the N. Fk. Umatilla River and Mill Creek. It may also occur at moderate elevations in the northern part of the East Cascades Ecoregion. Geomorphic surfaces on which this association occurs are bars and floodplains of major rivers and streams. Valleys are characteristically V-shaped, very narrow to broad in width, and intermediate in gradient. Sideslopes are moderately steep to steep. Soils are developing in alluvial silt and sand over gravels, cobbles, and stones. Depths to the coarse alluvium vary from 12 to 33 m. Adjacent Rosgen stream reach types identified were B2, B3, and B4 types. Stream widths are 1.5 to 15 m.

Valley Environment	Average	Range
Elevation (ft)	2877	2500-3120
Plot Slope (%)	4	2-5
Valley Width (m)	61	5-200
Valley Gradient (%)	4	2-7
Valley Sideslopes (%)	58	45-70
Local Climate		
Mean Annual Precipitation (in.)	43	40-45
Mean Annual Snowfall (in.)	70	55-79
Mean Annual Temperature (F)	46	45-47
Mean Minimum Temperature (F)	35	34-35
Mean Maximum Temperature (F)	57	56-58
Median Date of Last Spring Freeze	May 24	May 22-May 25
Median Date of First Fall Freeze	Sep. 24	Sep. 24-Sep. 25
Soil Surface Cover (%)		
Submerged	2	0-6
Bare Ground	tr	0-1
Gravel	1	0-4
Rock	6	3-10
Cryptogam	28	5-90
Litter	63	5-90

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt
Total Rooting Depth (cm)	avg.: 22; range: 13-33
Depth to 30% Coarse Fragments (cm)	avg.: 9; range: 0-33
Depth to 80% Coarse Fragments (cm)	avg.: 13; range: 0-33
Surface Layers	
Thickness (cm)	0-33
Texture(s)	silt loam, sandy loam
Coarse Fragments (%)	2-45 gravel
Roots: very fine	---
fine	few to many
medium	few
coarse	few
Redoximorphic Features	none
Substrate	gravel, cobble

Vegetation Composition

Red alder dominates the overstory tree layer of this association. The shrub layer consists primarily of Pacific ninebark, Lewis' mock-orange, common snowberry, western thimbleberry, cascara, and Rocky Mountain maple. Pacific ninebark is well represented to abundant on all sites, dominating the shrub layer. A diverse herbaceous understory is characterized by Hooker's fairy-bells, large-leaf avens, one-leaf foamflower, starry false-Solomon's seal, alpine mitrewort, trail plant, nodding fescue, and Dewey's sedge. Average herbaceous biomass is 833 lbs/acre, ranging from 533-1033 lbs/acre.

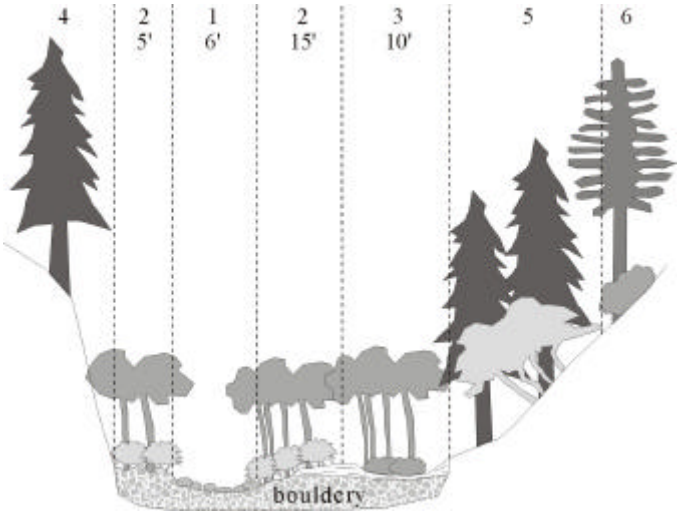
Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Red alder (*Alnus rubra*)	100	69	15-100
TREE OVERSTORY-SUBDOMINANTS			
Red alder (*Alnus rubra*)	20	5	--
TREE UNDERSTORY			
Grand fir (*Abies grandis*)	80	tr	tr-1
Red alder (*Alnus rubra*)	40	3	tr-5
SHRUBS			
Pacific ninebark (*Physocarpus capitatus*)	100	41	15-75
Lewis' mockorange (*Philadelphus lewisii*)	100	5	2-8
Common snowberry (*Symphoricarpos albus*)	80	4	1-8
Thimbleberry (*Rubus parviflorus*)	60	6	2-8
Cascara (*Frangula purshiana*)	60	2	tr-3
Rocky Mountain maple (*Acer glabrum*)	40	23	20-25
SEDGES and RUSHES			
Dewey's sedge (*Carex deweyana*)	60	3	1-4
PERENNIAL GRASSES			
Nodding fescue (*Festuca subulata*)	80	6	1-20
Blue wildrye (*Elymus glaucus*)	60	5	2-10
Tall mannagrass (*Glyceria striata*)	60	tr	tr-1
PERENNIAL FORBS			
Hooker's fairybells (*Disporum hookeri*)	100	4	tr-16
Large-leaf avens (*Geum macrophyllum*)	80	15	1-40
One-leaf foamflower (*Tiarella trifoliata* ssp. *unifoliata*)	80	12	1-40
Starry false Solomon's seal (*Maianthemum stellata*)	80	3	tr-10
Alpine mitrewort (*Mitella pentandra*)	80	2	--
Heart-leaved miner's lettuce (*Claytonia cordifolia*)	80	1	tr-2
Pathfinder (*Adenocaulon bicolor*)	60	15	tr-45
Wild ginger (*Asarum caudatum*)	60	4	tr-7
Mountain sweet cicily (*Osmorhiza berteroi*)	60	1	1-2
Enchanter's nightshade (*Circaea alpina*)	60	1	tr-2
Curly dock (*Rumex crispus*)	60	tr	tr-1
Sweet-scented bedstraw (*Galium triflorum*)	60	tr	tr-1
Columbia monkshood (*Aconitum columbianum*)	60	tr	tr-1
FERNS and HORSETAILS			
Ladyfern (*Athyrium filix-femina*)	60	6	1-15
Common horsetail (*Equisetum arvense*)	60	1	tr-3

Adjacent Vegetation

Upland vegetation types adjacent to plots sampled are: terraces - grand fir/Pacific ninebark; sideslopes - grand fir/Rocky Mountain maple, grand fir/twinflower, grand fir/swordfern-wild ginger, grand fir/Pacific ninebark, and Douglas fir/mallow ninebark (upper slopes).

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997

Illustrations



1 B2 stream reach
2 **Red alder/Pacific ninebark**, floodplain
3 **Red alder/common snowberry**, terrace
4 Grand fir, north-facing sideslope
5 Grand fir/Rocky Mountain maple, south-facing toeslope
6 Douglas-fir/common snowberry, south-facing sideslope

Tiger Creek, Walla Walla RD, Umatilla NF: moderately high gradient, moderately low elevation, V-shaped valley; Blue Mountains Ecoregion

Alnus rubra/Athyrium filix-femina Association

Red alder/Ladyfern Association
3 plots. CEGL000008 = *Alnus rubra/Athyrium felix-femina-Asarum caudatum.*

Ecoregional Range
BM, EC, WC

Environment and Soils
The Red alder/Ladyfern Association was sampled at moderately low elevations in the northern portion of the Blue Mountains in the Blue Mountains Ecoregion. The drainages on which red alder are found are the N. Fk. Umatilla River and Mill Creek. It may also occur at moderate elevations in the northern part of the East Cascades Ecoregion. Geomorphic sites are floodplains or wet seeps in low gradient, moderately wide to wide, flat- and V-shaped valleys with moderately steep sideslopes. Soils are composed of mineral materials and are shallow to skeletal horizons. The water table remains high in the soil profile throughout most of the growing season. The soil surface is very moist, and moss cover is 45% on both sample sites. Adjacent Rosgen stream reaches on sites sampled were B3 and B4.

Valley Environment	Average	Range
Elevation (ft)	2713	2500-2860
Plot Slope (%)	10	tr-22
Valley Width (m)	95	20-200
Valley Gradient (%)	4	2-7
Valley Sideslopes (%)	53	45-70
Local Climate		
Mean Annual Precipitation (in.)	42	40-45
Mean Annual Snowfall (in.)	71	55-81
Mean Annual Temperature (F)	45	45-47
Mean Minimum Temperature (F)	35	34-35
Mean Maximum Temperature (F)	56	55-58
Median Date of Last Spring Freeze	May 25	May 22-May 26
Median Date of First Fall Freeze	Sep. 24	Sep. 23-Sep. 25
Soil Characteristics		
Depth to 30% Coarse Fragments (cm)	17	0-33
Soil Surface Cover (%)		
Submerged	3	0-8
Bare Ground	4	tr-10
Gravel	tr	0-1
Rock	3	0-10
Cryptogam	50	45-60
Litter	44	40-50

Vegetation Composition

Red alder forms a dense tree overstory canopy. Pacific ninebark and red-osier dogwood are abundant on some sites. Ladyfern is the dominant herbaceous species, indicating the high moisture in the soils. Other important herbaceous species include: wild ginger, stinging nettle, sweet-scented bedstraw, Hooker's fairy bells, heartleaf miner's lettuce, violets, enchanter's nightshade and Dewey's sedge. Average height of herbaceous layer is 122 cm. Herbaceous biomass averages 1011 lbs/acre, ranging from 233-1467 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Red alder (*Alnus rubra*)	100	73	50-100
TREE OVERSTORY-SUBDOMINANTS			
Red alder (*Alnus rubra*)	33	10	--
TREE UNDERSTORY			
Red alder (*Alnus rubra*)	33	40	--
SHRUBS			
Pacific ninebark (*Physocarpus capitatus*)	67	30	--
Common snowberry (*Symphoricarpos albus*)	67	5	2-8
Lewis' mockorange (*Philadelphus lewisii*)	67	2	1-2
SEDGES and RUSHES			
Dewey's sedge (*Carex deweyana*)	100	3	1-6
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	67	3	2-3
Nodding Fescue *(Festuca subulata)*	67	2	1-2
PERENNIAL FORBS			
Wild ginger (*Asarum caudatum*)	100	5	4-6
Sweet-scented bedstraw (*Galium triflorum*)	100	tr	tr-5
Pathfinder (*Adenocaulon bicolor*)	67	23	tr-45
Hooker's fairy bells (*Disporum hookeri*)	67	9	2-16
Stinging nettle (*Urtica dioica*)	67	3	2-3
Violets (*Viola* spp.)	67	2	--
Heart-leaved miner's lettuce (*Claytonia cordifolia*)	67	tr	tr-1
Enchanter's nightshade (*Circaea alpina*)	67	tr	--
FERNS and HORSETAILS			
Ladyfern (*Athyrium filix-femina*)	100	40	15-55
Oakfern (*Gymnocarpium dryopteris*)	67	14	3-25
Swordfern (*Polystichum munitum*)	67	3	2-3

Adjacent Vegetation

Adjacent upland vegetation types are:
terraces grand fir/swordfern-wild ginger;
sideslopes grand fir/Rocky Mountain maple, other grand fir associations, Douglas-fir/mallow ninebark (mid to upper slopes).

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997: 100

Alnus rubra/Petasites frigidus var. palmatus Association

Red alder/Sweet coltsfoot Association
2 plots. CEGL003401

Valley Environment	Average	Range
Elevation (ft)	2640	2500-2780
Plot Slope (%)	2	--
Valley Width (m)	43	20-65
Valley Gradient (%)	5	2-7
Valley Sideslopes (%)	58	45-70
Soil Characteristics		
Depth to 30% Coarse Fragments (cm)	17	0-33
Depth to 80% Coarse Fragments (cm)	27	20-33
Soil Surface Cover (%)		
Submerged	1	0-2
Bare Ground	10	0-20
Gravel	-	-
Rock	tr	0-tr
Cryptogam	30	10-50
Litter	59	48-70

Ecoregional Range
BM, EC, WC

Environment and Soils

The Red alder/Sweet coltsfoot Association was sampled at moderately low elevations in the northwestern portion of the Blue Mountains in the Blue Mountains Ecoregion. The drainages on which red alder are found are the N. Fk. Umatilla River and Mill Creek. It probably also occurs at moderate elevations in the northern part of the East Cascades Ecoregion. Sites are floodplains. Valleys are narrow to moderately wide and V-shaped with moderate to steep gradients and moderately steep to steep sideslopes. Adjacent stream reach types were B4 and C3b.

Vegetation Composition

Red alder provided all the tree coverage over a scattered shrub layer and a dense underlying sweet coltsfoot layer. The shrub layer characteristically has Rocky Mountain maple, western thimbleberry, and Lewis' mockorange at low abundances. Other herbaceous species of importance are alpine mitrewort, stinging nettle, large-leaf avens, nodding fescue, blue wildrye, drooping woodreed and Dewey's sedge. Height of the shrub layer averages 1.2 m. Height of the herbaceous layer averages 38 cm. Herbaceous biomass averages 870 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Red alder (*Alnus rubra*)	50	50	--
TREE OVERSTORY-SUBDOMINANTS			
Red alder (*Alnus rubra*)	50	16	--
TREE UNDERSTORY			
Red alder (*Alnus rubra*)	100	48	35-60
SHRUBS			
Rocky Mountain maple (*Acer glabrum*)	100	5	--
Thimbleberry (*Rubus parviflorus*)	100	4	3-5
Lewis' mockorange (*Philadelphus lewisii*)	100	4	1-6
Pacific ninebark (*Physocarpus capitatus*)	50	10	--
Pacific yew (*Taxus brevifolia*)	50	8	--
SEDGES and RUSHES			
Dewey's sedge (*Carex deweyana*)	100	13	5-20
Soft-leaved sedge (*Carex disperma*)	100	1	tr-2
PERENNIAL GRASSES			
Drooping woodreed (*Cinna latifolia*)	100	23	6-40
Blue wildrye (*Elymus glaucus*)	100	tr	tr-1
PERENNIAL FORBS			
Sweet coltsfoot (*Petasites frigidus* var. *palmatus*)	100	55	40-70
Alpine mitrewort (*Mitella pentandra*)	100	8	5-10
Stinging nettle (*Urtica dioica*)	100	6	1-10
Oneleaf foamflower (*Tiarella trifoliata* var. *unifoliata*)	100	3	tr-5
Wild ginger (*Asarum caudatum*)	100	2	1-3
Heart-leaved miner's lettuce (*Claytonia cordifolia*)	100	2	1-2
Sweet-scented bedstraw (*Galium triflorum*)	100	tr	tr-1
Large-leaf avens (*Geum macrophyllum*)	50	7	--
FERNS and HORSETAILS			
Ladyfern (*Athyrium filix-femina*)	100	3	2-3

Adjacent Vegetation
Adjacent upland vegetation types are:
terraces - grand fir/Pacific ninebark;
sideslopes - grand fir/swordfern-wild ginger, grand fir/Pacific ninebark.

Other Studies Documenting Association with Plot Data
Oregon: Diaz and Mellon (1996) describe a red alder/sweet coltsfoot plant community that has similar dominant species but dissimilar associated species composition; Crowe and Clausnitzer 1997: 100

Alnus rubra/Cornus sericea ssp. sericea Association

Red alder/Red-osier dogwood Association
2 plots. New type

Ecoregional Range
BM, EC, WC

Environment and Soils
The Red alder/Pacific ninebark Association was sampled at moderately low elevations in the northwestern portion of the Blue Mountains in the Blue Mountains Ecoregion. The drainages on which red alder are found are the N. Fk. Umatilla River and Mill Creek. It may also occur at moderate elevations in the northern part of the East Cascades Ecoregion. Sites are coarse alluvium with a depth of 0-13 cm to cobbles of the old streambed. Valleys are moderate gradient, moderately wide, flat- and V-shaped with moderately steep to steep sideslopes. Adjacent Rosgen stream reaches are B3.

Valley Environment	Average	Range
Elevation (ft)	2935	2450-3420
Plot Slope (%)	3	1.5-5
Valley Width (m)	65	--
Valley Gradient (%)	4	2-5
Valley Sideslopes (%)	58	45-70
Soil Characteristics		
Depth to 30% Coarse Fragments (cm)	0	--
Depth to 80% Coarse Fragments (cm)	7	0-13
Soil Surface Cover (%)		
Submerged	2	0-3
Bare Ground	3	1-5
Gravel	tr	0-1
Rock	3	tr-5
Cryptogam	26	15-36
Litter	67	50-75

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Red alder (*Alnus rubra*)	100	68	40-95
TREE UNDERSTORY			
Red alder (*Alnus rubra*)	50	60	--
SHRUBS			
Red-osier dogwood (*Cornus sericea* spp. *sericea*)	100	30	10-50
Thimbleberry (*Rubus parviflorus*)	100	11	6-16
Common snowberry (*Symphoricarpos albus*)	100	4	2-5
Oceanspray (*Holodiscus discolor*)	50	8	--
Stinking swamp currant (*Ribes hudsonianum*)	50	6	--
SEDGES and RUSHES			
Dewey's sedge (*Carex deweyana*)	50	25	25
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	100	2	1-3
PERENNIAL FORBS			
Common cowparsnip (*Heracleum maximum*)	100	7	4-10
Heart-leaved miner's lettuce (*Claytonia cordifolia*)	100	4	tr-8
Hairy willow-herb (*Epilobium ciliatum*)	100	tr	--
Creeping buttercup (*Ranunculus repens*)	50	30	--
Alpine mitrewort (*Mitella pentandra*)	50	25	--
Wild ginger (*Asarum caudatum*)	50	21	--
Large-leaf avens (*Geum macrophyllum*)	50	5	--
FERNS and HORSETAILS			
Oakfern (*Gymnocarpium dryopteris*)	50	8	--
Ladyfern (*Athyrium filix-femina*)	50	4	--

Vegetation Composition
Red alder is extremely dense in these stands. The shrub layer (averaging 3m in height) comprises red-osier dogwood, western thimbleberry and common snowberry. Other occasional shrubs include oceanspray, stinking swamp currant, prickly currant. The herbaceous layer, averaging 31 cm in height, comprises common cowparsnip, blue wildrye, heart-leaved miner's lettuce and hairy willow-herb in all stands. Other important herbaceous species include creeping buttercup, alpine mitrewort, wild ginger, Dewey's sedge, large-leaf avens, sharptooth angelica and brook saxifrage. Average herbaceous biomass is 800 lbs/acre.

Adjacent Vegetation: Upland vegetation types adjacent to sites sampled are grand fir associations.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997

Alnus rubra / Symphoricarpos albus Association

Red alder/Common snowberry Association
3 plots. New type

Valley Environment	Average	Range
Elevation (ft)	2726	2550-2860
Plot Slope (%)	3	1-5
Valley Width (m)	90	5-200
Valley Gradient (%)	3	2-5
Valley Sideslopes (%)	62	45-70
Soil Characteristics		
Depth to 30% Coarse Fragments (cm)	7	0-20
Depth to 80% Coarse Fragments (cm)	18	0-36
Soil Surface Cover (%)		
Submerged	tr	0-1
Bare Ground	23	0-70
Gravel	tr	0-2
Rock	1	0-3
Cryptogam	38	5-60
Litter	37	25-50

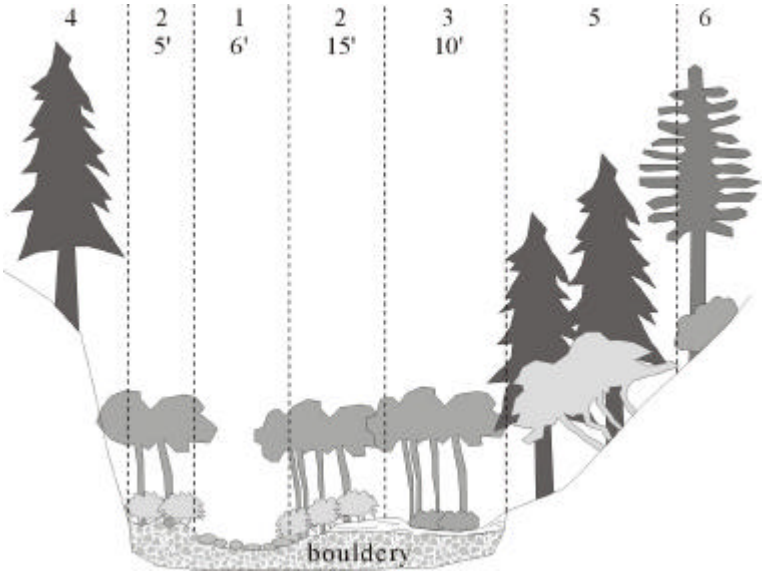
Ecoregional Range
BM, EC? WC?

Environment and Soils
The Red alder/Pacific ninebark Association was sampled at moderately low elevations in the northwestern portion of the Blue Mountains in the Blue Mountains Ecoregion. The drainages on which red alder are found are the N. Fk. Umatilla River and Mill Creek. It may also occur at moderate elevations in the northern part of the East Cascades Ecoregion. Geomorphic surfaces are high floodplains in moderate gradient, very narrow to wide, flat- and V-shaped valleys with moderately steep to steep sideslopes. Soils are poorly developed but do have thin surface layers of fine-textured silt loam material. Coarse fragments are abundant and found at shallow depths in the profile. Adjacent Rosgen stream reaches are B3a, B4 and B6.

Vegetation Composition
A red alder tree layer overtops the shrub layer composed principally of common snowberry. Grand fir and Douglas fir are present in small amounts, indicating that these sites may be seral to conifer associations. Black hawthorn and Lewis' mock-orange are well represented. Large-leaf avens, starry false-Solomon's seal, and Dewey's sedge are important herbaceous species. Average herbaceous biomass is 644 lbs/acre, ranging from 533-800 lbs/acre.

Illustrations

1 B2 stream reach
2 **Red alder/Pacific ninebark**, floodplain
3 **Red alder/common snowberry**, terrace
4 Grand fir, north-facing sideslope
5 Grand fir/Rocky Mountain maple, south-facing toeslope
6 Douglas-fir/common snowberry, south-facing sideslope



Tiger Creek, Walla Walla RD, Umatilla NF; moderately high gradient, moderately low elevation, V-shaped valley; Blue Mountains Ecoregion

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Red alder (*Alnus rubra*)	100	45	5-70
Grand fir (*Abies grandis*)	33	8	--
TREE OVERSTORY-SUBDOMINANTS			
Red alder (*Alnus rubra*)	67	30	10-50
Douglas fir (*Pseudotsuga menziesii*)	67	4	2-5
Grand fir (*Abies grandis*)	67	2	1-2
TREE UNDERSTORY			
Red alder (*Alnus rubra*)	67	2	tr-3
Grand fir (*Abies grandis*)	33	5	--
SHRUBS			
Common snowberry (*Symphoricarpos albus*)	100	48	30-75
Lewis' mockorange (*Philadelphus lewisii*)	100	5	1-10
Thimbleberry (*Rubus parviflorus*)	100	4	2-5
Rocky Mountain maple (*Acer glabrum*)	67	4	1-7
Pacific ninebark (*Physocarpus capitatus*)	67	4	1-6
Black hawthorn (*Crataegus douglasii*)	33	15	--
SEDGES and RUSHES			
Dewey's sedge (*Carex deweyana*)	67	5	4-6
PERENNIAL GRASSES			
Nodding fescue (*Festuca subulata*)	100	2	1-3
Drooping woodreed (*Cinna latifolia*)	67	3	2-3
Columbia brome (*Bromus vulgaris*)	67	tr	tr-1
PERENNIAL FORBS			
Large-leaf avens (*Geum macrophyllum*)	100	10	tr-25
Wild ginger (*Asarum caudatum*)	100	6	1-12
Starry false Solomon's seal (*Maianthemum stellata*)	100	2	1-3
Hooker's fairybells (*Disporum hookeri*)	67	5	1-8
Creeping buttercup (*Ranunculus repens*)	33	75	--
Alpine mitrewort (*Mitella pentandra*)	33	40	--
One-leaf foamflower (*Tiarella trifoliata* ssp. *unifoliata*)	33	30	--
FERNS and HORSETAILS			
Ladyfern (*Athyrium filix-femina*)	100	4	2-8
Swordfern (*Polystichum munitum*)	100	4	2-6

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled is grand fir associations.

Successional Dynamics
Grand fir and Douglas fir are present in small amounts, indicating that these sites may be seral to conifer associations, especially the Grand fir/Common snowberry Association.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997

Populus tremuloides/Carex aquatilis var. aquatilis Association

Quaking aspen/Aquatic sedge Association
2 plots. CEGL003442

Ecoregional Range
BM, CB

Environment and Soils
Sites are wet forested basins at moderate elevations in wide, low gradient, trough-shaped valleys with gentle sideslopes. Soils are composed of fine-textured mineral materials with high water-holding capacities. One site had redoximorphic features at 74 cm.

Vegetation Composition
Quaking aspen and sparse to abundant subordinant conifers comprise an overstory layer. Beneath this, an understory of grasses and sedges dominate. Aquatic sedge is abundant on both sites. Other important herbaceous species are bluejoint reedgrass, common timothy, Dewey's sedge, Nevada rush, Jones' sedge, spike bentgrass, tall mannagrass, tufted hairgrass, green false hellebore, willow-herbs, and elephant's head. Biomass for one site was 2967 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Quaking aspen (*Populus tremuloides*)	100	58	35-80
Engelmann spruce (*Picea engelmannii*)	50	30	--
Grand fir (*Abies grandis*)	50	10	--
Lodgepole pine (*Pinus contorta*)	50	5	--
TREE UNDERSTORY-			
Quaking aspen (*Populus tremuloides*)	50	80	--
Subalpine fir (*Abies lasiocarpa*)	50	80	--
SEDGES and RUSHES			
Aquatic sedge (*Carex aquatilis* var. *aquatilis*)	100	28	25-30
Dewey's sedge (*Carex deweyana*)	50	10	--
Nevada rush (*Juncus nevadensis*)	50	8	--
Jones' sedge (*Carex jonesii*)	50	5	--
PERENNIAL GRASSES			
Bluejoint reedgrass (*Calamagrostis canadensis*)	100	33	5-60
Common timothy (*Phleum pratense*)	100	5	1-8
Spike bentgrass (*Agrostis exarata*)	50	40	--
Blue wildrye (*Elymus glaucus*)	50	20	--
Tall mannagrass (*Glyceria striata*)	50	18	--
Tufted hairgrass (*Deschampsia caespitosa*)	50	15	--
PERENNIAL FORBS			
Butterweeds (*Senecio* spp.)	100	5	4-5
Green false hellebore (*Veratrum viride*)	50	8	--
Willow-herbs (*Epilobium* spp.)	50	8	--
Elephant's head (*Pedicularis groenlandica*)	50	5	--
Leafy aster (*Symphyotrichum foliaceum var. foliaceum*)	50	4	--
Great North aster (*Canadanthus modestus*)	50	3	--
Large-leaf avens (*Geum macrophyllum*)	50	3	--
Wild onions (*Allium* spp.)	50	3	--

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are: grand fir and Idaho fescue (*Festuca idahoensis*) and bluebunch wheatgrass (*Pseudoroegneria spicatum*).

Successional Dynamics
This association may develop from Populus tremuloides/Calamagrostis canadensis when soil water tables increase, providing a more suitable habitat for *Carex aquatilis* var. *aquatilis*. With a lack of fire sites with abundant conifer cover may succeed to a conifer/aquatic sedge composition.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997

Populus tremuloides/Carex pellita Association

Quaking aspen/Woolly sedge Association
7 plots. CEGL000577

Ecoregional Range
BM, BR, EC

Environment and Soils

The *Populus tremuloides/Carex pellita* Association occur at moderate to moderately high elevations in the south-central part of the Blue Mountains Ecoregion and in the southeastern portion of the East Cascades Ecoregion. Sites are usually wide, low gradient, moist basins in trough-shaped valleys with gentle to moderately steep sideslopes. These basins function as headwaters for perennial streams in the area. Soils have surface horizons of fine-textured silt loam with silty clay loams or silty clays below. Bulk density of these soils increases with depth. In contrast to other aspen communities described in this study, the water table's mean depth is 40 cm in June-July.

Two plots were associated with small streams (Rosgen types C6 and G6).

Valley Environment	Average	Range
Elevation (ft)	5223	4650-6020
Plot Slope (%)	1	0-5
Valley Width (m)	167	20-350
Valley Gradient (%)	3	2-5
Valley Sideslopes (%)	21	15-45
Local Climate		
Mean Annual Precipitation (in.)	22	16-25
Mean Annual Snowfall (in.)	85	67-124
Mean Annual Temp (F)	43	41-44
Mean Minimum Temp (F)	30	29-32
Mean Maximum Temp (F)	55	52-58
Median Date of Last Spring Freeze	June 29	June 24-July 9
Median Date of First Fall Freeze	Sep. 1	Aug. 25-Sep. 7
Soil Surface Cover (%)		
Submerged	8	0-41
Bare Ground	11	0-75
Gravel	-	-
Rock	-	-
Moss	8	0-21
Lichen	tr	0-tr
Litter	75	10-100

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt, tuff, mixed alluvium, pumice
Total Rooting Depth (cm)	avg.: 40; range: 30-51
Water Table Depth (cm)	avg.: 56; range 10-160
Depth to Redoximorphic Features (cm)	avg.: 23; range: 10-16
Surface Layer	
Thickness (cm)	10-35
Texture(s)	silt loam, silty clay loam
Coarse Fragments (%)	0
Roots: very fine	many
fine	many
medium	none to few
coarse	none to few
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	13-89
Texture(s)	silty clay, silty clay, sandy loam
Coarse Fragments (%)	0
Roots: very fine	many
fine	common to many
medium	none to common
coarse	none to few
Redoximorphic Features	common iron oxidation
Substrate	clay-rich silt loam to loam

Vegetation Composition

Quaking aspen dominates both the overstory and understory tree layers in the association. Occasional conifer regeneration in low abundance appears accidental in this wet type. Shrubs are poorly represented and herbaceous vegetation, particularly grasses and sedges, dominate the understory. Woolly sedge is abundant with mean coverage of 45%. Kentucky bluegrass and blue wildrye are occasionally abundant grasses. Starry false-Solomon's seal, broad-petal strawberry, western meadowrue, field mint, western blue flag, sweet-scented bedstraw, and long-stalked clover are occasionally well represented in the forb layer. Average height of herbaceous layer is 47 cm, ranging from 20-91 cm. Average herbaceous biomass is 804 lbs/acre, ranging from 300-1166 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Quaking aspen (*Populus tremuloides*)	86	49	15-75
TREE OVERSTORY-SUBDOMINANTS			
Quaking aspen (*Populus tremuloides*)	57	21	8-50
Lodgepole pine (*Pinus contorta*)	29		
TREE UNDERSTORY			
Quaking aspen (*Populus tremuloides*)	100	8	tr-30
Ponderosa pine (*Pinus ponderosa*)	29	tr	tr-1
SEDGES and RUSHES			
Woolly sedge (*Carex pellita*)	100	45	10-70
Baltic rush (*Juncus balticus*)	57	3	tr-7
Nebraska sedge (*Carex nebrascensis*)	43	6	tr-15
Smallwing sedge (*Carex microptera*)	43	1	tr-2
Aquatic sedge (*Carex aquatilis* var. *aquatilis*)	29	12	3-20
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	86	6	tr-10
Common timothy (*Phleum pratense*)	57	2	tr-4
Blue wildrye (*Elymus glaucus*)	43	25	1-65
PERENNIAL FORBS			
Starry false Solomon's seal (*Maianthemum stellata*)	71	16	2-50
Broadpetal strawberry (*Fragaria virginiana*)	71	5	tr-20
Dandelion (*Taraxacum officinale*)	71	1	tr-2
Yarrow (*Achillea millefolium*)	75	tr	tr-1
Large-leaf avens (*Geum macrophyllum*)	71	1	tr-2
Field mint (*Mentha arvensis*)	57	12	tr-35
Rocky Mountain iris (*Iris missouriensis*)	43	9	1-25
Western meadowrue (*Thalictrum alpinum*)	43	8	1-20
Meadow arnica (*Arnica chamissonis*)	43	6	3-12
Long-stalk clover (*Trifolium longipes*)	43	2	tr-4

Adjacent Vegetation

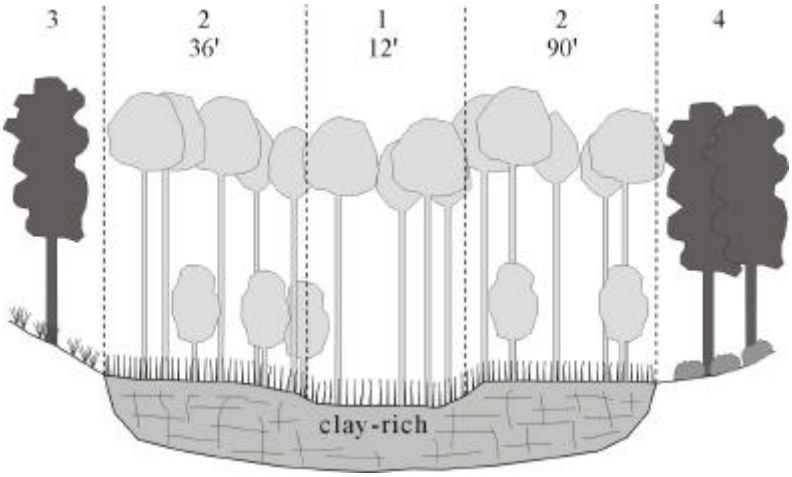
Upland vegetation types adjacent to sites sampled are:
terraces- ponderosa pine/Kentucky bluegrass; ponderosa pine/elk sedge, ponderosa pine/mountain big sagebrush or bitterbrush/Idaho fescue-bluebunch wheatgrass and/or ponderosa pine/low sagebrush.

Successional Dynamics

This association is very likely a self-perpetuating quaking aspen association with no strong likelihood of succeeding to another tree-dominated or to a shrub-dominated association even with a long-term lack of fire. Aboveground aspen stems are killed by even low severity fire but will readily regenerate from underground root clones. Woolly sedge and other graminoids that typify this site will also regenerate after fire.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997: 78
Washington: Kovalchik 2001

Illustrations



1 C6 stream reach
2 **Quaking aspen/woolly sedge**, headwater basin
3 **Ponderosa pine/elk sedge**, west-facing sideslope
4 **Ponderosa pine/low sagebrush**, east-facing sideslope

E. Fork Rattlesnake Creek, Burns RD, Malheur NF; very low gradient, mod. high elevation, trough-shaped headwater basin; Blue Mountains Ecoregion

Populus tremuloides / Calamagrostis canadensis Association

Quaking aspen/Bluejoint reedgrass Association
3 plots. CEGL000574

Ecoregional Range
BM, EC

Environment and Soils

The Populus tremuloides / Calamagrostis canadensis Association was sampled only in the northern part of the Blue Mountains Ecoregion but is likely to occur in the central Blue Mountains as well as at moderately high elevations (where bluejoint reedgrass occurs in greater abundance) in the Cascade Mountains of the East Cascades Ecoregion. It occurs in wet basins in wide, very low gradient, trough-shaped valleys. Soils are composed of fine-textured silt loam and clay loam with increasing bulk density at depth. Water-holding capacity is high. The water table fluctuates from high in the soil profile early in the growing season to 70+ cm below the soil surface in late summer.

Valley Environment	Average	Range
Elevation (ft)	4638	4035-4960
Plot Slope (%)	1	0-1
Valley Width (m)	350	--
Valley Gradient (%)	2	--
Valley Sideslopes (%)	15	--
Local Climate		
Mean Annual Precipitation (in.)	33	22-42
Mean Annual Snowfall (in.)	93	62-119
Mean Annual Temperature (F)	43	42-44
Mean Minimum Temperature (F)	33	32-34
Mean Maximum Temperature (F)	53	50-55
Median Date of Last Spring Freeze	June 10	June 7-June 13
Median Date of First Fall Freeze	Sep. 13	Sep. 8-Sep. 17
Soil Surface Cover (%)		
Submerged	16	0-50
Bare Ground	23	5-35
Gravel	2	0-5
Bedrock	2	0-5
Rock	2	0-5
Cryptogam	12	10-15
Litter	35	10-85

Vegetation Composition

Quaking aspen dominates a multi-storied tree layer with grasses and sedges prominent in the understory. Bluejoint reedgrass is abundant. Shrubs are nearly absent. Commonly occurring herbaceous species are tufted hairgrass, Smallwing sedge, leafy aster, green false hellebore, starry false-Solomon's seal, feathery Solomonplume, and sweetmarsh butterweed. Average height of the herbaceous layer is 31 cm.

Adjacent Vegetation

Upland vegetation adjacent to sites sampled: grand fir associations

Successional Dynamics

This association may be seral to a conifer/bluejoint reedgrass association.

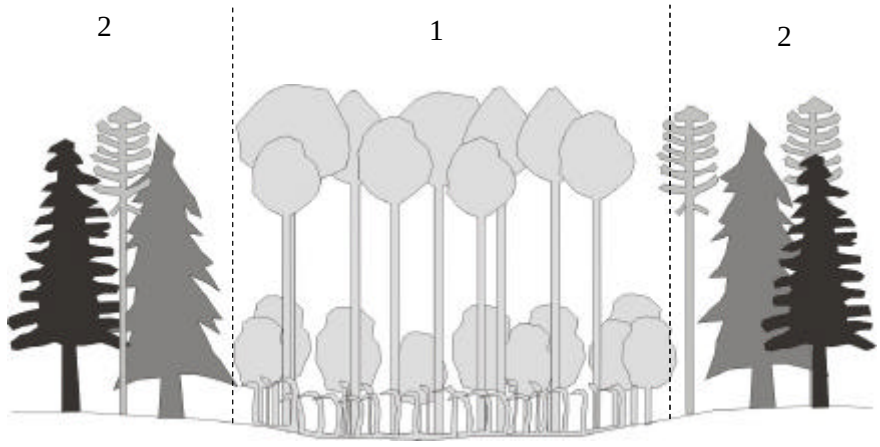
Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997: 84
Montana: Hansen *et al.* 1995

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Quaking aspen (*Populus tremuloides*)	100	52	25-70
TREE UNDERSTORY			
Quaking aspen (*Populus tremuloides*)	100	34	11-70
Engelmann spruce (*Picea engelmannii*)	100	1	tr-2
SHRUBS			
Alder-leaved buckthorn (*Rhamnus alnifolia*)	67	tr	--
SEDGES and RUSHES			
Smallwing sedge (*Carex microptera*)	67	3	2-3
PERENNIAL GRASSES			
Bluejoint reedgrass (*Calamagrostis canadensis*)	100	64	25-97
Tufted hairgrass (*Deschampsia caespitosa*)	67	19	8-30
PERENNIAL FORBS			
Leafy aster (*Symphyotrichum foliaceum var. foliaceum*)	67	11	1-20
Green false hellebore (*Veratrum viride*)	67	7	1-12
Starry false Solomon's seal (*Maianthemum stellata*)	67	3	tr-6
Feathery Solomonplume (*Maianthemum racemosa*)	67	tr	--
Sweetmarsh butterweed (*Senecio hydrophiloides*)	33	40	--
Long-stalk clover (*Trifolium longipes*)	33	12	--

Illustrations

1.**Quaking aspen/ Bluejoint reedgrass Association**, moist meadow
2.Grand fir-Engelmann spruce-lodgepole pine forest, dry meadow



Walla Walla Ranger District, Umatilla NF; very low gradient, mod. elevation, flat-shaped valley; Mesic Forest Province 2.

Populus tremuloides-Pinus contorta var. latifolia/Spiraea douglasii Association

Quaking aspen-lodgepole pine/Douglas' spiraea Association
3 plots. CEGL000157.

Ecoregional Range
EC

Environment and Soils
Sites are inactive floodplains in small, pumice-filled drainages at moderate elevations. Sites probably have lower water-holding capacity than those in the *Populus tremuloides-Pinus contorta* ssp. *latifolia/Spiraea douglasii/Carex angustata* Association.

Valley Environment	Average	Range
Elevation (ft)	4927	4640-5300
Plot Slope (%)	3	0-5
Valley Gradient (%)	4	3-5
Local Climate		
Mean Annual Precipitation (in.)	24	22-27
Mean Annual Snowfall (in.)	80	77-85
Mean Annual Temperature (F)	43	43-44
Mean Minimum Temperature (F)	28	27-30
Mean Maximum Temperature (F)	59	57-59
Median Date of Last Spring Freeze	July 2	June 28-July 8
Median Date of First Fall Freeze	Aug. 28	Aug. 18-Sep. 5
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	2	0-5
Gravel	-	-
Rock	-	-
Cryptogam	5	0-15
Litter	93	80-100

Vegetation Composition
Quaking aspen is dominant in the tree overstory forming a moderately dense canopy. Douglas spiraea forms a dense shrub layer. Common snowberry and bearberry are occasionally well represented. Commonly associated grasses and forbs are nodding brome, blue wildrye, northern bedstraw, starry false-Solomon's seal, prairie sage, broadpetal strawberry, fireweed, yarrow and blue violet.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Quaking aspen (*Populus tremuloides*)	100	45	37-60
Lodgepole pine (*Pinus contorta*)	33	37	--
Grand fir (*Abies grandis*)	33	20	--
TREE OVERSTORY-SUBDOMINANTS			
Lodgepole pine (*Pinus contorta*)	67	11	7-15
Ponderosa pine (*Pinus ponderosa*)	33	5	--
TREE UNDERSTORY			
Quaking aspen (*Populus tremuloides*)	100	5	3-10
Lodgepole pine (*Pinus contorta*)	67	3	--
Ponderosa pine (*Pinus ponderosa*)	67	2	--
Grand fir (*Abies grandis*)	33	5	--
SHRUBS			
Douglas' spiraea (*Spiraea douglasii*)	100	52	37-70
Wood's rose (*Rosa woodsii*)	100	3	1-5
Bearberry (*Arctostaphylos uva-ursi*)	67	15	--
Common snowberry (*Symphoricarpos albus*)	33	45	--
PERENNIAL GRASSES			
Nodding brome (*Bromus anomalus*)	67	10	5-15
Blue wildrye (*Elymus glaucus*)	67	5	--
PERENNIAL FORBS			
Northern bedstraw (*Galium boreale*)	100	7	tr-15
Starry false Solomon's seal (*Maianthemum stellata*)	100	5	tr-10
Prairie sage (*Artemisia ludoviciana*)	100	tr	--
Broadpetal strawberry (*Fragaria virginiana*)	67	8	tr-15
Fireweed (*Chamerion angustifolium*)	67	3	tr-5
Blue violet (*Viola adunca*)	67	tr	--
Yarrow (*Achillea millefolium*)	67	tr	--

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are: Ponderosa pine-lodgepole pine stands.

Successional Dynamics
This association is successional to the Lodgepole pine/Douglas spiraea Association except at very low elevations, where quaking aspen is climax.

With overuse by livestock, quaking aspen is still well stocked in the overstory but suckers are limited. Douglas spiraea decreases in cover and widefruit sedge is co-dominant with blue wildrye, Kentucky bluegrass, and/or forbs. Aspen is sensitive to all but the coolest ground fire. It may cause immediate mortality or damage the bole, allowing entrance for wood-rotting fungi. Aspen sprouts vigorously from lateral root buds. Reduced evapotransporation demand caused by removal of the overstory may elevate water tables, increase the cover of willows and interfere with the success of aspen regeneration. Willows and Douglas spiraea will sprout from stem bases. Clearcutting will favor aspen while partial cutting will favor lodgepole pine. Cutting may increase the level of the water table and increase the cover of willows.

Other Studies Documenting Association with Plot Data
Oregon: Kovalchik 1987: 136

Populus tremuloides-Pinus contorta var. latifolia/Spiraea douglasii/Carex angustata Association

Quaking aspen-lodgepole pine/Douglas' spiraea/Widefruit sedge Association
6 plots. New type

Ecoregional Range
EC

Environment and Soils
The Quaking aspen-lodgepole pine/Douglas spiraea/widefruit sedge Association is common on the pumice-filled drainages in the eastern East Cascades Ecoregion. A similar association occurs rarely in the central Blue Mountains Ecoregion with an understory of aquatic sedge (Carex aquatilis var. aquatilis) instead of widefruit sedge. Landforms are floodplains, basins, and shallow, pumice-filled drainages at low to moderate elevations. See the description for the Sitka sedge Association for another figure showing this community type. Microtopography is flat to slightly concave. Sample plots were located in several unnamed drainages on the Winema National Forest and at Shevlin Park, Aspen Camp, and Slough Camp on the Deschutes National Forest. Soils are derived from alluvium. Surface soil textures ranged from organic loam to loam and grade into permanently saturated coarse pumice subsoil. Available water holding capacity is high. The sites are slightly flooded or the water table is within 25 cm of the soil surface in May and June and are within 100 cm of the soil surface in August and September.

Valley Environment	Average	Range
Elevation (ft)	4247	3600-4690
Plot Slope (%)	2	0-5
Valley Gradient (%)	2	1-5
Local Climate		
Mean Annual Precipitation (in.)	19	12-22
Mean Annual Snowfall (in.)	66	37-82
Mean Annual Temperature (F)	44	43-46
Mean Minimum Temperature (F)	30	27-33
Mean Maximum Temperature (F)	59	57-60
Median Date of Last Spring Freeze	July 5	June 30-July 8
Median Date of First Fall Freeze	Aug. 22	Aug. 18-Aug. 31
Soil Characteristics		
Current Water Table Depth (cm)	69	40-110
Thickness of Surface Organic Layer (when present) (cm)	21	15-30
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	-	-
Gravel	-	-
Rock	-	-
Cryptogam	6	0-20
Litter	78	0-100

Vegetation Composition

This association is dominated by an overstory of quaking aspen and a shrub layer of Douglas spiraea (sometimes pyramid spiraea). Widefruit sedge is common. Willows (especially Geyer and Lemmon willows) are present and will dramatically increase in vigor and cover with overstory removal. Forbs are common and include broadpetal strawberry and starry false Solomon's plume. This association is successional to the Lodgepole pine/Douglas spiraea/widefruit sedge Association except at very low elevations, where quaking aspen is climax.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Quaking aspen (*Populus tremuloides*)	83	56	25-85
Lodgepole pine (*Pinus contorta*)	50	53	40-70
TREE OVERSTORY-SUBDOMINANTS			
Lodgepole pine (*Pinus contorta*)	33	6	2-10
Quaking aspen (*Populus tremuloides*)	17	10	--
TREE UNDERSTORY			
Quaking aspen (*Populus tremuloides*)	100	17	5-40
Lodgepole pine (*Pinus contorta*)	67	5	1-7
SHRUBS			
Douglas' spiraea (*Spiraea douglasii*)	83	29	5-60
Wood's rose (*Rosa woodsii*)	67	6	2-10
Geyer willow (*Salix geyeriana*)	67	6	1-7
Lemmon willow (*Salix lemmonii*)	50	3	2-5
SEDGES and RUSHES			
Widefruit sedge (*Carex angustata*)	100	20	5-40
Baltic rush (*Juncus balticus*)	67	tr	--
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	100	2	tr-3
Blue wildrye (*Elymus glaucus*)	83	7	2-15
Fowl bluegrass (*Poa palustris*)	50	2	2-3
PERENNIAL FORBS			
Broadpetal strawberry (*Fragaria virginiana*)	83	3	tr-5
Starry false Solomon's seal (*Maianthemum stellata*)	67	6	2-10
Streambank butterweed (*Senecio pseudaureus*)	67	4	3-5
Dandelion (*Taraxacum officinale*)	67	2	tr-3
Western polemonium (*Polemonium occidentale*)	50	3	tr-5
Western St. John's wort (*Hypericum formosum*)	50	2	--
Red columbine (*Aquilegia formosa*)	50	2	tr-3
Meadow arnica (*Arnica chamissonis*)	50	2	tr-3
Oregon checkermallow (*Sidalcea oregana*)	50	2	tr-2
Large-leaf avens (*Geum macrophyllum*)	50	2	tr-2
Slender cinquefoil (*Potentilla gracilis*)	50	tr	--

Successional Dynamics

This association is successional to the Lodgepole pine/Douglas spiraea/widefruit sedge Association except at very low elevations, where quaking aspen is climax.

With overuse by livestock, quaking aspen is still well stocked in the overstory but suckers are limited. Douglas spiraea decreases in cover and widefruit sedge is co-dominant with blue wildrye, Kentucky bluegrass, and/or forbs. Aspen is sensitive to all but the coolest ground fire. It may cause immediate mortality or damage the bole, allowing entrance for wood-rotting fungi. Aspen sprouts vigorously from lateral root buds. Reduced evapotransporation demand caused by removal of the overstory may elevate water tables, increase the cover of willows and interfere with the success of aspen regeneration. Willows and Douglas spiraea will sprout from stem bases. Clearcutting will favor aspen while partial cutting will favor lodgepole pine. Cutting may increase the level of the water table and increase the cover of willows.

Adjacent Vegetation

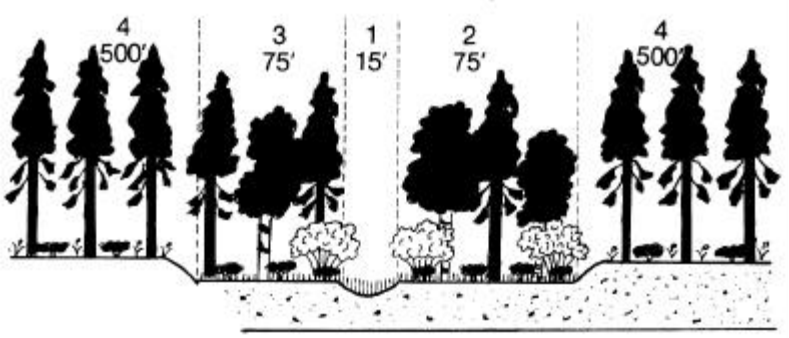
Upland vegetation types adjacent to sites sampled are: dry white fir and Ponderosa pine and Ponderosa pine-lodgepole pine stands.

Other Studies Documenting Association with Plot Data

Oregon: Kovalchik 1987: 63

Illustrations

1 **Widefruit sedge**, intermittently active swale
2 **Quaking aspen-lodgepole pine/Douglas spiraea/widefruit sedge**, active floodplain
3 **Lodgepole pine/Douglas spiraea/widefruit sedge**, active floodplain
4 **Lodgepole pine/Douglas spiraea**, terrace



Unnamed drainage near Highway 97 and Williamson River; low gradient, mod elevation floodplain; East Cascades Ecoregion

Populus tremuloides / Alnus incana Association

Quaking aspen/Mountain alder Association
1 plot. CEGL001150

Ecoregional Range
BM, BR, CB?, EC

Environment and Soils
This association can be found at moderate to moderately high elevations along moderate gradient streams in the Blue Mountains, Basin and Range, East Cascades and Columbia Basin Ecoregions. Soils have a shallow silt loam to loam surface horizon and skeletal subsoil. The site sampled for this classification had 80% coarse fragments at 43 cm in the soil horizon.

Vegetation Composition
Quaking aspens is the sole overstory tree. Mountain alder, averaging 4.6 m in height, and common snowberry and prickly currant, averaging 0.9 m in height, comprise the shrub layer, which averages 4.6 m in height. Major herbaceous species include creeping bentgrass, asters, western meadowrue, clovers, and large-leaf avens. Height of the herbaceous layer averages 23 cm. Herbaceous biomass was 530 lbs/acre.

Adjacent Vegetation
Upland vegetation adjacent to site sampled: Ponderosa pine

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer (1997) described this association as *Populus tremuloides/Alnus incana/Symphoricarpos albus.*

Dominant Species	Canopy Cover (%)
TREE OVERSTORY-DOMINANTS	
Quaking aspen (*Populus tremuloides*)	30
TREE OVERSTORY-SUBDOMINANTS	
Quaking aspen (*Populus tremuloides*)	2
TREE UNDERSTORY	
Grand fir (*Abies grandis*)	3
Quaking aspen (*Populus tremuloides*)	1
Ponderosa pine (*Pinus ponderosa*)	1
SHRUBS	
Mountain alder (*Alnus incana*)	40
Common snowberry (*Symphoricarpos albus*)	15
Prickly currant (*Ribes lacustre*)	tr
SEDGES and RUSHES	
Dewey's sedge (*Carex deweyana*)	1
PERENNIAL GRASSES	
Creeping bentgrass (*Agrostis stolonifera*)	10
Tall mannagrass (*Glyceria striata*)	5
Kentucky bluegrass (*Poa pratensis*)	3
Blue wildrye (*Elymus glaucus*)	2
Western fescue (*Festuca occidentalis*)	tr
PERENNIAL FORBS	
Asters (*Aster* spp.)	25
Western meadowrue (*Thalictrum alpinum*)	15
Clovers (*Trifolium* spp.)	9
Large-leaf avens (*Geum macrophyllum*)	3
Broadpetal strawberry (*Fragaria virginiana*)	2
Sweet-scented bedstraw (*Galium triflorum*)	2
Common cowparsnip (*Heracleum maximum*)	1
FERNS and HORSETAILS	
Common horsetail (*Equisetum arvense*)	3

Populus tremuloides/Cornus sericea ssp. sericea Association

Quaking aspen/Red-osier dogwood Association
3 plots. CEGL000582

Ecoregional Range
BM, BR, CB, EC

Environment and Soils
Sites are streambanks and floodplains at moderate elevations. Valleys are V- and trough-shaped, narrow and moderate to high gradient with moderately steep to steep sideslopes. Associated Rosgen stream types are A4 and B3. A shallow silt loam to loam surface horizon lies over a skeletal subsoil. Depth to 80% coarse fragments on one site was 18 cm.

Valley Environment	Average	Range
Elevation (ft)	4833	4300-5300
Plot Slope (%)	13	3-30
Valley Width (m)	20	--
Valley Gradient (%)	6	2-10
Valley Sideslopes (%)	53	45-70
Local Climate		
Mean Annual Precipitation (in.)	20	13-26
Mean Annual Snowfall (in.)	50	42-55
Mean Annual Temperature (F)	45	42-47
Mean Minimum Temperature (F)	32	29-34
Mean Maximum Temperature (F)	58	56-59
Median Date of Last Spring Freeze	June 8	May 29-June 21
Median Date of First Fall Freeze	Sep. 16	Sep. 5-Sep. 25
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	25	0-50
Gravel	5	0-10
Rock	3	0-5
Cryptogam	3	0-5
Litter	65	30-100

Vegetation Composition
Populus tremuloides forms a moderately dense to dense canopy over a dense shrub canopy primarily composed of red-osier dogwood, Wood's rose, common chokecherry, common snowberry, mountain alder over Lewis' mockorange. The herbaceous layer generally is sparse, although one sample site had 60% blue wildrye cover.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Quaking aspen (*Populus tremuloides*)	67	58	45-70
TREE OVERSTORY-SUBDOMINANTS			
Quaking aspen (*Populus tremuloides*)	67	9	3-15
TREE UNDERSTORY			
Quaking aspen (*Populus tremuloides*)	33	12	--
SHRUBS			
Red-osier dogwood (*Cornus sericea*)	100	48	35-70
Common chokecherry (*Prunus virginiana*)	67	12	3-20
Wood's rose (*Rosa woodsii*)	67	12	8-15
Common snowberry (*Symphoricarpos albus*)	33	60	--
Mountain alder (*Alnus incana*)	33	25	--
PERENNIAL FORBS			
Yellow monkeyflower (*Mimulus guttatus*)	67	tr	--
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	67	tr	--

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are: mountain big sagebrush and Ponderosa pine.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer (1997: 84) described the *Populus tremuloides/Alnus incana-Cornus stolonifera* Association that includes plots that would fit this association
Washington: Kovalchik 2001; Crawford 2001
Idaho: Jankovsky-Jones *et al.* 2001: 114
Nevada: Manning and Padgett 1995
Montana: Hansen *et al.* 1995: 235
Utah and southeastern Idaho: Padgett *et al.* 1989
Colorado: Kittel *et al.* 1999

Populus tremuloides / Salix lemmonii Association

Quaking aspen/Lemmon willow Association
1 plot. New type

Ecoregional Range
BM?, BR, CB?

Environment and Soils
One site was sampled in this association in the Owyhee Uplands area of the Basin and Range Ecosystem. It may also occur in big sagebrush zones of the Blue Mountains and Columbia Basin Ecoregions. The site sampled is a spring within a very narrow (<10m wide), 7% gradient, V-shaped valley with moderately steep sideslopes.

Vegetation Composition
The stand structure comprises a dense quaking aspen tree overstory, a well-distributed stand of Lemmon willow in the shrub layer and a carpet of herbaceous species, dominated by butterweed groundsel, sweet-scented bedstraw and red columbine.

Dominant Species	Canopy Cover (%)
TREE OVERSTORY-DOMINANTS	
Quaking aspen (*Populus tremuloides*)	80
TREE OVERSTORY-SUBDOMINANTS	
Western juniper (*Juniperus occidentalis*)	3
TREE UNDERSTORY	
Quaking aspen (*Populus tremuloides*)	3
Western juniper (*Juniperus occidentalis*)	tr
SHRUBS	
Lemmon willow (*Salix lemmonii*)	30
Golden currant (*Ribes aureum*)	8
Wax currant (*Ribes cereum*)	3
Wood's rose (*Rosa woodsii*)	1
Common snowberry (*Symphoricarpos albus*)	1
PERENNIAL GRASSES	
Blue wildrye (*Elymus glaucus*)	3
Kentucky bluegrass (*Poa pratensis*)	3
PERENNIAL FORBS	
Butterweed groundsel (*Senecio serra*)	30
Sweet-scented bedstraw (*Galium triflorum*)	20
Red columbine (*Aquilegia formosa*)	13
Stinging nettle (*Urtica dioica*)	3

Adjacent Vegetation
Upland vegetation adjacent to sample site is big sagebrush.

Other Studies Documenting Association
none

Populus tremuloides / Betula occidentalis Association

Quaking aspen/Water birch Association
1 plot. CEGL002650.

Ecoregional Range
BM, BR, CB?

Environment and Soils
This association occurs in the western part of the Blue Mountains Ecoregion in the High Lava Plains area of central Oregon. This association may occur in areas of the Blue Mountains, Basin and Range, and Columbia Basin Ecoregions where *Betula occidentalis* grows. One site was sampled at 2660 ft. elevation on a streambank with a 2% gradient adjacent to a Rosgen B4 stream type. The valley is north-facing, V-shaped, <10m wide, with a 2% gradient with very steep sideslopes.

Vegetation Composition
The vegetation is this stand is not dense. Quaking aspen dominates the tree overstory and water birch the shrub layer. Grasses and forbs are sparse.

Dominant Species	Canopy Cover (%)
TREE OVERSTORY-DOMINANTS	
Quaking aspen (*Populus tremuloides*)	38
TREE UNDERSTORY	
Quaking aspen (*Populus tremuloides*)	tr
Western juniper (*Juniperus occidentalis*)	tr
Black cottonwood (*Populus balsamifera* ssp. *trichocarpa*)	tr
SHRUBS	
Water birch (*Betula occidentalis*)	15
Golden currant (*Ribes aureum*)	tr
Wood's rose (*Rosa woodsii*)	tr
PERENNIAL GRASSES	
Canby's bluegrass (*Poa secunda*)	tr
Blue wildrye (*Elymus glaucus*)	tr
Spike bentgrass (*Agrostis exarata*)	tr
Bulbous bluegrass (*Poa bulbosa*)	tr
PERENNIAL FORBS	
Yellow monkeyflower (*Mimulus guttatus*)	3
Cutleaf waterparsnip (*Berula erecta*)	3
Sweet clover (*Medicago* spp.)	tr
American speedwell (*Veronica americana*)	tr
Hairy willow-herb (*Epilobium ciliatum*)	tr

Adjacent Vegetation
Upland vegetation adjacent to site sampled: big sagebrush.

Other Studies Documenting Association with Plot Data
Nevada: Manning and Padgett 1995
Colorado: Kittel *et al.* 1999

Populus tremuloides/Prunus virginiana Association

Quaking aspen/Common chokecherry Association
2 plots. CEGL000596

Ecoregional Range
BR

Environment and Soils
This association occurs in the Basin and Range Ecoregion. It is found in springs and in floodplains in very narrow, high gradient, V- and box-shaped canyons with steep sideslopes. One site had a adjacent Rosgen B2 stream type. Soils have high coarse fragment contents.

Valley Environment	Average	Range
Elevation (ft)	5410	5320-5500
Plot Slope (%)	16	2-30
Valley Width (m)	20	--
Valley Gradient (%)	6	5-7
Valley Sideslopes (%)	70	--
Local Climate		
Mean Annual Precipitation (in.)	14	13-14
Mean Annual Snowfall (in.)	36	33-39
Mean Annual Temperature (F)	47	46-48
Mean Minimum Temperature (F)	34	32-37
Mean Maximum Temperature (F)	59	--
Median Date of Last Spring Freeze	May 31	May 19-June 11
Median Date of First Fall Freeze	Sep. 22	Sep. 13-Oct. 11
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	13	5-20
Gravel	tr	tr
Rock	15	tr-30
Cryptogam	tr	0-tr
Litter	73	50-95

Vegetation Composition
Quaking aspen is the dominant in the tree overstory over a scattered shrub understory. Common chokecherry is a constant in both stands sampled. Scouler willow was abundant on one site. The shrub understory is occupied by golden currant, Wood's rose, common snowberry and wax currant. The herbaceous layer is sparse. Common herbaceous species are blue wildrye, Kentucky bluegrass, cheatgrass, sweet-scented bedstraw, yarrow, ballhead waterleaf, feathery Solomonplume and groundsels (*Senecio* spp.).

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Quaking aspen (*Populus tremuloides*)	100	65	60-70
TREE OVERSTORY-SUBDOMINANTS			
Western juniper (*Juniperus occidentalis*)	50	3	--
TREE UNDERSTORY			
Quaking aspen (*Populus tremuloides*)	100	2	tr-3
Western juniper (*Juniperus occidentalis*)	100	tr	--
SHRUBS			
Common chokecherry (*Prunus virginiana*)	100	11	8-13
Serviceberry (*Amelanchier alnifolia*)	100	4	tr-8
Golden currant (*Ribes aureum*)	100	2	1-3
Wood's rose (*Rosa woodsii*)	100	2	tr-3
Common snowberry (*Symphoricarpos albus*)	100	tr	tr-1
Wax currant (*Ribes cereum*)	100	tr	tr-1
Scouler willow (*Salix scouleriana*)	50	40	--
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	100	1	--
Blue wildrye (*Elymus glaucus*)	50	13	--
PERENNIAL FORBS			
Sweet-scented bedstraw (*Galium triflorum*)	100	15	tr-30
Yarrow (*Achillea millefolium*)	100	tr	--
Ballhead waterleaf (*Hydrophyllum capitatum*)	50	3	--
ANNUAL FORBS and GRASSES			
Cheatgrass (*Bromus tectorum*)	100	3	--

Adjacent Vegetation
Upland vegetation adjacent to sites sampled: big sagebrush.

Other Studies Documenting Association with Plot Data
South Dakota (Black Hills): Marriott and Faber-Langendoen 2000

Populus tremuloides / Symphoricarpos albus Association

Quaking aspen/Common snowberry Association
13 plots. CEGL000609

Ecoregional Range
BM, BR, EC

Environment and Soils

The Quaking aspen/Common snowberry Association is common and widely located at moderately low to moderately high elevations in the East Cascades, Basin and Range and Blue Mountains Ecoregions. It is probably also found in the Columbia Basin Ecoregion. Landforms are moderate gradient floodplains, dry or moist basins, terraces, or seeps. Sites are often transitional between true riparian and uplands. Trough-shaped, low and moderate gradient narrow to moderately wide valleys with gentle to moderately steep sideslopes are characteristic of sampled areas. Some sites are in deep, higher gradient V-shaped valleys. Soils of sites sampled in the East Cascades Ecoregion are derived from alluvium, ash deposited over colluvium, or mixtures of both. Surface horizons range from fine sandy loam to clay loam. They lie near sources of water such as streams, springs, and meadows. Soils of sites sampled in the Blue Mountains Ecoregion have surface horizons of loam or silt loam and subsurface horizons of fairly dense silty clay loam overlying gravel and cobble substrates. A few profiles had an ash layer present just above the dense clay. Available water holding capacity is high. Decomposition of aspen litter improves soils fertility with increased nitrogen and organic matter. The soil surface may be briefly flooded at snowmelt on frozen soil but the water table lowers to more than 120 cm below the surface in August and September. Where streams were present, they were classified as Rosgen A3, F3 and F6 types.

Vegetation Composition

This community type is dominated by quaking aspen in the tree layer with conifers occasionally well represented or abundant. The herbaceous layer is generally dominated by grasses and sedges with Kentucky bluegrass, blue wildrye, nodding fescue, and elk sedge as important understory members. The forbs are a diverse group including yarrow, red columbine, rough bedstraw, northern bedstraw, sweet cicily, starry false Solomon's seal, and western meadowrue. Average height of the shrub layer is 0.6 m, ranging from 0.3-0.9 m. Average height of the herbaceous layer is 103 cm, ranging from 91-122 cm. Herbaceous biomass averages 778 lbs/acre, ranging from 433-1000 lbs/acre.

Valley Environment	Average	Range
Elevation (ft)	4902	3500-6280
Plot Slope (%)	5	0-20
Valley Width (m)	47	20-65
Valley Gradient (%)	5	1-15
Valley Sideslopes (%)	38	15-70
Local Climate		
Mean Annual Precipitation (in.)	24	14-36
Mean Annual Snowfall (in.)	93	22-189
Mean Annual Temperature (F)	43	40-48
Mean Minimum Temperature (F)	30	27-36
Mean Maximum Temperature (F)	56	50-61
Median Date of Last Spring Freeze	June 28	May 30-July 7
Median Date of First Fall Freeze	Sep. 1	Aug. 22-Sep. 11
Soil Surface Cover (%)		
Submerged	0	-
Bare Ground	3	0-15
Gravel	-	0-tr
Rock	3	0-30
Cryptogam	4	0-37
Litter	78	10-100

Soil Profile Characteristics	
Bedrock/Parent Material(s)	andesite, glacial moraines, unknown marine, mixed sedimentary
Total Rooting Depth (cm)	avg.: 37; range: 25-51
Water Table Depth (cm)	avg.: 120; range: 90-150
Surface Layer	
Thickness (cm)	10-52
Texture(s)	silt loam, silty clay loam, sandy loam
Coarse Fragments (%)	0-5, gravel
Roots: very fine	many
fine	many
medium	common to many
coarse	none
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	20-50
Texture(s)	silty clay loam, clay loam, loam, sandy clay loam, sandy loam
Coarse Fragments (%)	0-30, gravel
Roots: very fine	none to many
fine	few to many
medium	few to common
coarse	few to common
Redoximorphic Features	some iron oxidation
Substrate	gravel, cobble (often clay-rich)

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Quaking aspen (*Populus tremuloides*)	100	52	2-80
Ponderosa pine (*Pinus ponderosa*)	23	29	20-37
TREE OVERSTORY-SUBDOMINANTS			
Ponderosa pine (*Pinus ponderosa*)	23	10	1-15
Lodgepole pine (*Pinus contorta*)	15	8	1-15
Black cottonwood (*Populus balsamifera* ssp. *trichocarpa*)	15	4	3-5
Quaking aspen (*Populus tremuloides*)	8	3	--
TREE UNDERSTORY			
Quaking aspen (*Populus tremuloides*)	77	11	1-45
Ponderosa pine (*Pinus ponderosa*)	39	4	2-7
Western juniper (*Juniperus occidentalis*)	31	2	tr-3
SHRUBS			
Common snowberry (*Symphoricarpos albus*)	100	35	7-70
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	77	17	tr-50
Blue wildrye (*Elymus glaucus*)	77	15	tr-60
PERENNIAL FORBS			
Yarrow (*Achillea millefolium*)	77	3	tr-12
Red columbine (*Aquilegia formosa*)	62	1	tr-5
Northern bedstraw (*Galium boreale*)	46	5	tr-18
Wood's strawberry (*Fragaria vesca*)	46	2	tr-5

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are: terraces - ponderosa pine/common snowberry, Douglas fir/ common snowberry;

sideslopes – Ponderosa pine/big sagebrush/elk sedge, ponderosa pine-Douglas-fir, grand fir/pinegrass, grand fir/elk sedge and/or subalpine fir/elk sedge and other big sagebrush, Ponderosa pine, white fir, lodgepole pine and grand fir associations.

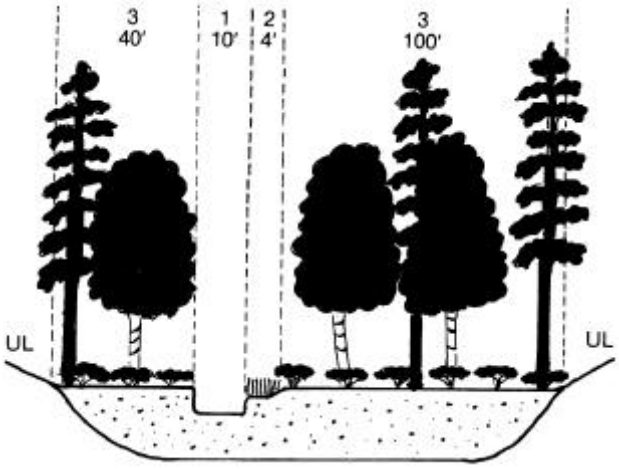
Successional Dynamics

With overuse by livestock, common snowberry becomes clumpy in distribution and its canopy cover is less than 35%. The aspen overstory is still well stocked but aspen suckering is limited. Kentucky bluegrass is co-dominant with other grasses and forbs. With continued overuse, the aspen overstory becomes poorly stocked and overmature. Aspen suckers are absent. Common snowberry is restricted to protected microsites or absent. Kentucky bluegrass, other grasses, and forbs dominate the herbaceous layer. Eventually, grazing may eliminate conifers as well as aspen, converting the site to herbaceous meadows dominated by blue wildrye, Kentucky bluegrass, or forbs. The suppression of fire has contributed to the conversion of aspen stands to conifers or meadows. Stands in this association that do not burn on a periodic basis may be successional to the Ponderosa pine/Common snowberry Association. Fire can be an important tool for stimulating aspen suckers and rejuvenating deteriorating stands. It will often have to be used in concert with protection from browsing. Snowberry will resprout from stem bases.

Other Studies Documenting Association with Plot Data

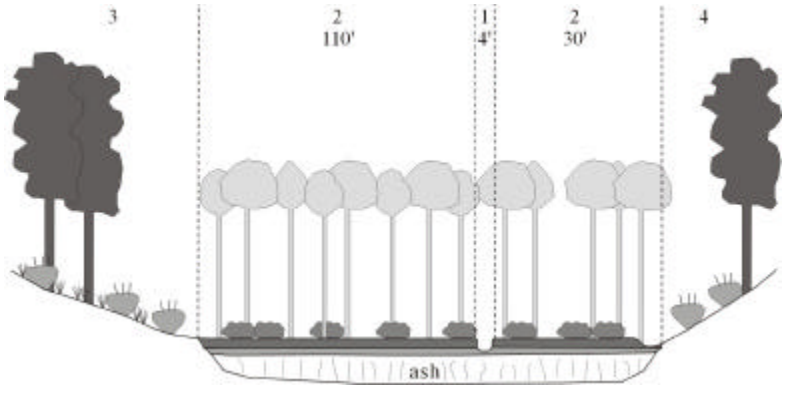
Oregon: Kovalchik 1987: 59; Crowe and Clausnitzer 1997: 80
Washington: Kovalchik 2001; Crawford 2001
Nevada: Weixelman *et al.* 1996: 4-73

Illustrations



1 Indian Ford Creek, second order
2 **Small-fruit bulrush**, active channel shelf
3 **Quaking aspen/common snowberry**, inactive floodplain

Indian Ford Creek; low gradient, low elevation floodplain; East Cascades Ecoregion



1 E6 stream reach
2 **Quaking aspen/common snowberry**, dry headwater basin
3 Ponderosa pine/big sagebrush/elk sedge, northwest-facing sideslope
4 Ponderosa pine/big sagebrush/graminoid, southeast-facing sideslope

South Fork John Day River Headwaters; low gradient, moderately high elevation, trough-shaped valley; Blue Mountains Ecoregion

Populus tremuloides/Elymus glaucus Association

Quaking aspen/Blue wildrye Association
9 plots. CEGL000946

Ecoregional Range
BM, BR, EC

Environment and Soils
The Quaking aspen/Blue wildrye Association is common in the East Cascades Ecoregion and in the western Blue Mountains Ecoregion Landforms are usually on the margins of well drained basins, but also occur on floodplains and toeslopes. This association tends to occur above the elevational limits of the Quaking aspen/Common snowberry Association. Microtopography is flat to concave. Sample plots were located at Crooked, Deep, Spring, Twelvemile, and Drew Creeks, White Pine Marsh, Gearhart Mountain, and Cottonwood Lake on the Fremont National Forest; Cold Springs Guard Station and Dudley Creek on the Ochoco National Forest; Meadow Creek on the Winema National Forest; and Prairie Farm on the Deschutes National Forest; and on a tributary to the North Minam River on the Wallowa Whitman National Forest. Soils are variably of alluvium and/or colluvium. Surface horizons are uniformly fine textured, ranging from fine sandy loam to clay loam. Available water capacity is moderately high to high. Water tables are within 25 cm of the soil surface in May and June and lower to more than 90 cm below the soil surface by mid July. Decomposition of aspen leaves improves soil fertility with increased nitrogen and organic matter.

Vegetation Composition
Quaking aspen is the dominant tree. Many plots appear to be on meadow invasion sites and show little evidence that aspen is successional to conifers. Some stands are successional to lodgepole pine. Shrubs and sedges are scarce although degraded quaking aspen/common snowberry stands might appear to belong in this community type. Blue wildrye dominates the herbaceous layer in natural. Mountain brome is also abundant on many sites. Common forbs include yarrow, large-leaved avens, sweet cicily, Gairdner's yampa, streambank buttercup, California false hellebore, dandelion and Gray's licorice-root.

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are: Ponderosa pine and one subalpine fir associations

Valley Environment	Average	Range
Elevation (ft)	6313	5600-7000
Plot Slope (%)	14	2-35
Valley Width (m)	65	--
Valley Gradient (%)	12	2-25
Valley Sideslopes (%)	15	--
Local Climate		
Mean Annual Precipitation (in.)	30	21-61
Mean Annual Snowfall (in.)	135	56-388
Mean Annual Temperature (F)	42	35-46
Mean Minimum Temperature (F)	29	25-32
Mean Maximum Temperature (F)	55	45-59
Median Date of Last Spring Freeze	June 30	June 21-July 11
Median Date of First Fall Freeze	Sep. 2	Aug. 25-Sep. 9
Soil Characteristics		
Current Water Table Depth (cm)	72	55-95
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	23	0-80
Gravel	tr	0-2
Rock	1	0-5
Cryptogam	-	0-15
Litter	76	20-100

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Quaking aspen (*Populus tremuloides*)	78	45	25-75
Lodgepole pine (*Pinus contorta*)	11	20	--
TREE OVERSTORY-SUBDOMINANTS			
Grand fir (*Abies grandis*)	33	5	2-7
Quaking aspen (*Populus tremuloides*)	22	13	10-15
Ponderosa pine (*Pinus ponderosa*)	22	6	1-10
Lodgepole pine (*Pinus contorta*)	11	2	--
TREE UNDERSTORY			
Quaking aspen (*Populus tremuloides*)	89	28	2-60
Ponderosa pine (*Pinus ponderosa*)	56	2	1-3
Grand fir (*Abies grandis*)	44	11	3-25
Lodgepole pine (*Pinus contorta*)	22	2	1-2
SHRUBS			
Prickly currant (*Ribes lacustre*)	44	2	--
SEDGES and RUSHES			
Smallwing sedge (*Carex microptera*)	44	4	2-5
Thick-headed sedge (*Carex pachystachya*)	44	2	tr-5
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	100	27	7-63
Mountain brome (*Bromus carinatus*)	78	9	tr-40
Alpine timothy (*Phleum alpinum*)	67	1	tr-2
Meadow barley (*Hordeum brachyantherum*)	56	3	tr-10
PERENNIAL FORBS			
Dandelion (*Taraxacum officinale*)	100	2	tr-5
Yarrow (*Achillea millefolium*)	78	3	2-7
Gairdner's yampa (*Perideridia gairdneri*)	78	1	tr-2
California false-hellebore (*Veratrum californicum*)	67	15	3-35
Sweet cicily (*Thalictrum* spp.)	56	4	2-7
Gray's licorice-root (*Ligusticum grayi*)	44	5	2-10
Sticky starwort (*Pseudostellaria jamesiana*)	44	4	2-5
Streambank buttercup (*Ranunculus uncinatus*)	44	4	2-5
Longstalk clover (*Trifolium longipes*)	44	3	2-5
Broadleaf bluebells (*Mertensia ciliata*)	44	3	2-3

Successional Dynamics

With overuse by livestock, the aspen overstory is still well stocked with aspen but aspen suckers become limited. Kentucky bluegrass, other grasses, and forbs become co-dominant with blue wildrye. California false hellebore may become dominant on highly disturbed stands. With continued overuse, the aspen overstory becomes poorly stocked and overmature. Aspen suckers are absent or severely hedged. Blue wildrye is uncommon or absent and Kentucky bluegrass is co-dominant or subordinant to forbs. Eventually aspen may be completely eliminated, converting the site to herbaceous meadows dominated by forbs such as California false hellebore, sweet cicily, starry false-Solomon's seal, stinging nettle, stream buttercup, long-stalk clover, western meadowrue, and bedstraws. The suppression of fire has contributed to the conversion of aspen stands to lodgepole pine or herbaceous meadows. Fire can be an important tool for stimulating aspen suckers and rejuvenating deteriorated aspen standsm, but may need to be used in concert with protection from beaver.

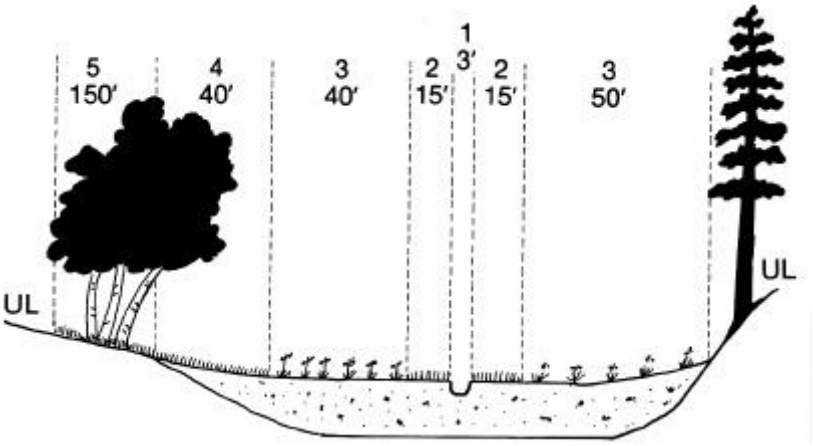
Other Studies Documenting Association with Plot Data

Oregon: Kovalchik 1987: 61

Nevada: Manning and Padgett (1995) describe a Populus tremuloides/Bromus carinatus community type that is very similar to this association

California: Weixelman *et al.* 1999

Illustrations



1 Dudley Creek, first-order
2 **Inflated sedge**, wet meadow
3 **Tufted hairgrass**, moist meadow
4 Kentucky bluegrass (**tufted hairgrass** potential), dry meadow
5 **Quaking aspen/blue wildrye**, transition slope

Dudley Creek; low gradient, moderate elevation basin; Blue Mountains Ecoregion

Populus tremuloides/Geum macrophyllum-Maianthemum stellata Association

Quaking aspen/Large-leaf avens-starry false-Solomon's seal Association
5 plots. New type

Ecoregional Range
BM, BR?, CB?, EC

Environment and Soils
This association was sampled in the western and central Blue Mountains Ecoregion and the central East Cascades Ecoregion but may be more widespread. Sites are moist forested basins in very wide, low gradient, trough-shaped valleys with gentle sideslopes. Soils are composed primarily of fine-textured mineral materials. Surface horizon textures range from thin histic to loam, silt loam or clay-loam. Water tables are high in the profile early in the growing season and may drop to 50-75 cm below the soil surface by late summer. Coarse fragments are sparse to absent.

Valley Environment	Average	Range
Elevation (ft)	4932	4400-5460
Plot Slope (%)	2	0-3
Valley Width (m)	350	--
Valley Gradient (%)	3	1-5
Valley Sideslopes (%)	15	--
Local Climate		
Mean Annual Precipitation (in.)	25	20-36
Mean Annual Snowfall (in.)	79	60-105
Mean Annual Temperature (F)	43	42-45
Mean Minimum Temperature (F)	31	29-33
Mean Maximum Temperature (F)	56	55-57
Median Date of Last Spring Freeze	June 24	June 18-July 4
Median Date of First Fall Freeze	Sep. 4	Aug. 27-Sep. 9
Soil Characteristics		
Current Water Table Depth (cm)	49	27-74
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	2	0-10
Gravel	-	-
Rock	-	-
Cryptogam	1	0-6
Litter	97	90-100

Vegetation Composition
Quaking aspen dominates these stands, but Ponderosa and lodgepole pine may be well-represented in some stands. Shrubs are sparse to absent. A wide variety of forbs dominate the herbaceous layer, the most constant of which are large-leaf avens, starry false-Solomon's seal, northern bedstraw, broadpetal strawberry, slender cinquefoil and stream buttercup.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Quaking aspen (*Populus tremuloides*)	100	36	12-70
Lodgepole pine (*Pinus contorta*)	20	25	--
TREE OVERSTORY-SUBDOMINANTS			
Quaking aspen (*Populus tremuloides*)	40	43	20-65
Lodgepole pine (*Pinus contorta*)	40	10	5-15
Ponderosa pine (*Pinus ponderosa*)	40	5	--
TREE UNDERSTORY			
Quaking aspen (*Populus tremuloides*)	80	21	4-30
Lodgepole pine (*Pinus contorta*)	40	5	2-7
Ponderosa pine (*Pinus ponderosa*)	40	1	--
SHRUBS			
Prickly currant (*Ribes lacustre*)	40	7	1-13
SEDGES and RUSHES			
Smallwing sedge (*Carex microptera*)	40	1	tr-2
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	40	10	5-15
PERENNIAL FORBS			
Large-leaf avens (*Geum macrophyllum*)	100	tr	tr-2
Starry false Solomon's seal (*Maianthemum stellata*)	80	19	3-40
Northern bedstraw (*Galium boreale*)	80	4	tr-10
Broadpetal strawberry (*Fragaria virginiana*)	60	6	1-15
Dandelion (*Taraxacum officinale*)	60	6	3-9
Slender cinquefoil (*Potentilla gracilis*)	60	3	tr-5
Yarrow (*Achillea millefolium*)	60	2	tr-5
Stream buttercup (*Ranunculus uncinatus*)	60	1	tr-2

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
terraces – mountain big sagebrush
sideslopes – lodgepole pine-grand fir, white fir and Ponderosa pine associations

Successional Dynamics
This association is probably self-perpetuation, especially if periodic fires burn sites, removing conifers. If, however, fire is excluded for many decades, conifers may become dominant in the tree overstory and create too much shade for quaking aspen sprouts to successfully mature and perpetuate the aspen clone.

Other Studies Documenting Association with Plot Data
Listed below are classified associations and community types that have some similarity to this *Populus tremuloides/Geum macrophyllum-Smilacina stellata* Association
Oregon: Crowe and Clausnitzer 1997: *Populus tremuloides*/Mesic Forb
Nevada: Manning and Padgett 1995: *Populus tremuloides*/Mesic Forb
Colorado: Kittel *et al.* 1999: *Populus tremuloides*/Tall Forb

HIGH ELEVATION TREE ASSOCIATIONS

*Picea engelmannii-Abies lasiocarpa/Ledum glandulosum Swamp Association**

Engelmann spruce-Subalpine fir/Labrador tea Swamp Association
2 plots. New type

Ecoregional Range
BM

Environment and Soils
These two plots were sampled in the upper reaches of the North Minam River in the Wallowa Mountains. The elevation range is 5370-5400 ft. Both occurred in very low gradient (<1%), wide valleys (100-300 m) with steep sideslopes (60-90%). Sites are hummocky with approximately 60-100 cm relief between the top of the hummocks and the bottom of the swales.

Vegetation Composition
Conifers occur on the tops of the hummocks along with Labrador tea, big huckleberry, bearberry honeysuckle, oneleaf foamflower, pink wintergreen, violets, sidebells pyrola, queen's cup beadlily and claspleaf twistedstalk. Swales are dominated by stinking swamp currant, common horsetail and graminoid species such as smooth-stemmed sedge, Holm's sedge, bladder sedge, swordleaf rush, bluejoint reedgrass and tall mannagrass. Herbaceous biomass averages 704 lbs/acre, ranging from 672-736 lbs/acre.

Adjacent Vegetation
Meadows adjacent to these sampled swamp sites were dominated by Aquatic sedge meadows.
Upland vegetation adjacent to sampled sites are:
terraces and sideslopes: subalpine fir associations.

Successional Dynamics
These sites are generally stable. A change in soil hydrologic conditions, i.e. a lowering or raising of the water table, would cause a change in association. If water tables lowered, sites would probably change to subalpine fir/Labrador tea associations. If water tables rise, a very gradual die-off of conifers would occur, and the site would probably eventually convert to a Holm's sedge association, or if wet enough, a bladder sedge association. With severe fire that kills the conifers, shrubs will increase in cover and this may result in long term dominance of the site by a Labrador tea-big huckleberry/swamp association.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
DOMINANT OVERSTORY TREES			
Engelmann spruce (*Picea engelmannii*)	100	21	20-22
Subalpine fir (*Abies lasiocarpa*)	100	15	6-23
SUBDOMINANT OVERSTORY TREES			
Engelmann spruce (*Picea engelmannii*)	100	13	5-20
Subalpine fir (*Abies lasiocarpa*)	100	5	--
UNDERSTORY TREES			
Subalpine fir (*Abies lasiocarpa*)	100	7	6-7
Engelmann spruce (*Picea engelmannii*)	100	4	2-5
SHRUBS			
Labrador tea (*Ledum glandulosum*)	100	28	10-45
Big huckleberry (*Vaccinium membranaceum*)	100	11	2-20
Stinking swamp currant (*Ribes hudsonianum*)	100	4	3-5
Bearberry honeysuckle (*Lonicera involucrata*)	100	1	--
SEDGES and RUSHES			
Smooth-stemmed sedge (*Carex laeviculmis*)	100	35	30-40
Holm's sedge (*Carex scopulorum*)	100	16	6-25
Bladder sedge (*Carex utriculata*)	100	4	1-6
Swordleaf rush (*Juncus ensifolius*)	100	2	1-2
PERENNIAL GRASSES			
Bluejoint reedgrass (*Calamagrostis canadensis*)	100	25	10-40
Tall mannagrass (*Glyceria striata*)	100	13	5-20
PERENNIAL FORBS			
Oneleaf foamflower (*Tiarella trifoliata* var. *unifoliata*)	100	15	--
Pink wintergreen (*Pyrola asarifolia*)	100	9	3-15
Violets (*Viola* spp.)	100	5	--
Sidebells pyrola (*Orthilia secunda*)	100	8	6-10
Queen's cup beadlily (*Clintonia uniflora*)	100	3	1-5
Claspleaf twistedstalk (*Streptopus amplexifolius*)	100	3	1-5
PERENNIAL FORBS			
Common horsetail (*Equisetum arvense*)	100	60	--

Other Studies Documenting Association
none

Picea engelmannii-Abies lasiocarpa/Vaccinium uliginosum/Carex scopulorum

Engelmann spruce-Subalpine fir/Bog blueberry/Holm's sedge Association
4 plots. CEGL000380

Ecoregional Range
BM, EC

Environment and Soils
This association is located in the Elkhorn Mountains of the Blue Mountains Ecoregion and in the East Cascades Ecoregion. Sites are in wet basins at moderately high to high elevations. Geomorphic surfaces are hummocky with approximately 30-60 cm height between the top of the hummocks (where the conifers and bog blueberry occur) and the bottom of the swales (where the Holm's sedge occurs). Valleys are north to east-facing with low to moderate gradient. Soils are histosols that remain wet to saturated throughout the growing season

Valley Environment	Average	Range
Elevation (ft)	6213	5500-7020
Plot Slope (%)	2	1-5
Valley Gradient (%)	4	2-5
Local Climate		
Mean Annual Precipitation (in.)	48	36-67
Mean Annual Snowfall (in.)	241	170-337
Mean Annual Temperature (F)	41	39-43
Mean Minimum Temperature (F)	29	27-32
Mean Maximum Temperature (F)	52	49-54
Median Date of Last Spring Freeze	June 28	June 21-July 10
Median Date of First Fall Freeze	Sep. 1	Aug. 29-Sep. 6
Soil Characteristics		
Depth to Wet Soil (cm)	0	--
Depth to Redoximorphic Features (cm)	0	--
Thickness of Surface Organic Layer (cm)	75	55-95
Soil Surface Cover (%)		
Submerged	1	0-2
Bare Ground	24	0-90
Cryptogam	66	10-93
Litter	11	0-30

Vegetation Composition
Trees (subalpine fir, Engelmann spruce and lodgepole pine) are generally dwarfed and confined to hummocks. The open nature of the tree canopy will promote co-dominance of these overstory members. Much of the cover listed below in the Tree Understory category consists of stunted, older trees that would be taller on more favorable sites. This type is unique among forested types in that the trees do not form a continuous canopy and don't account for a great amount of total canopy cover. It is very distinctive in physiognomy and structure on the landscape, however, and is easily recognizable as an association. Bog blueberry dominates the shrub layer; alpine laurel grouse huckleberry and red mountain heath are associated shrubs. Holm's sedge creates a dense sward in the microswales on the site with mean coverage of 65%. Height of the shrub layer averages 30 cm. Height of the herbaceous layer averages 33 cm. Herbaceous biomass averages 567 lbs/acre, ranging from 200-933 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Engelmann spruce (*Picea engelmannii*)	50	13	1-25
TREE OVERSTORY-SUBDOMINANTS			
Engelmann spruce (*Picea engelmannii*)	75	8	4-15
Lodgepole pine (*Pinus contorta*)	75	7	1-15
Subalpine fir (*Abies lasiocarpa*)	75	6	3-10
TREE UNDERSTORY			
Subalpine fir (*Abies lasiocarpa*)	100	5	1-11
Engelmann spruce (*Picea engelmannii*)	100	3	2-4
SHRUBS			
Bog blueberry (*Vaccinium uliginosum*)	100	21	10-40
Grouse huckleberry (*Vaccinium scoparium*)	100	3	1-6
Alpine laurel (*Kalmia microphylla*)	75	2	1-5
Red mountain-heath (*Phyllodoce empetriformis*)	50	6	2-10
Douglas' spiraea (*Spiraea douglasii*)	50	4	3-5
SEDGES and RUSHES			
Holm's sedge (*Carex scopulorum*)	100	46	15-75
Jones' sedge (*Carex jonesii*)	75	2	1-5
Swordleaf rush (*Juncus ensifolius*)	75	1	1-2
Field woodrush (*Luzula campestris*)	75	1	1-2
Few-flowered spikerush (*Eleocharis quinqueflora)*	50	3	1-5
Drummond's rush (*Juncus drummondii*)	50	1	--
Star sedge (*Carex echinata*)	50	1	--
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	75	2	1-5
Bluejoint reedgrass (*Calamagrostis canadensis*)	50	4	2-5
Tall mannagrass (*Glyceria striata*)	50	3	1-6
Weak alkaligrass (*Torreyochloa pallida* var. *pauciflora*)	50	1	--
PERENNIAL FORBS			
Jeffrey's shooting star (*Dodecatheon jeffreyi*)	75	3	1-5
White marsh marigold (*Caltha leptosepala* ssp. *howellii*)	75	2	1-5
Alpine shooting star (*Dodecatheon alpinum*)	75	2	1-5
American bistort (*Polygonum bistortoides*)	75	2	1-5
High mountain cinquefoil (*Potentilla flabellifolia*)	75	1	1-3
Alpine mitrewort (*Mitella pentandra*)	75	1	1-2
Fireweed (*Chamerion angustifolium*)	75	1	--

Adjacent Vegetation

Upland vegetation adjacent to sampled sites are:
terraces Engelmann spruce-lodgepole pine/bog blueberry/sedge spp.;
sideslopes – subalpine fir/Labrador tea (*Ledum glandulosum*), lodgepole pine (subalpine fir)/grouse huckleberry' subalpine fir/pokeweed (*Polygonum phytolaccifolium*), and other subalpine fir associations.

Successional Dynamics

These sites are generally stable. With severe fire that kills the conifers, shrubs will increase in cover and this may result in long term dominance of the site by a bog blueberry-grouse huckleberry-dominated association.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer (1997) called this type Subalpine fir/Bog blueberry/Holm's sedge; Kovalchik (1987: 53) described an Engelmann spruce/Bog blueberry/Widefruit Sedge Association in which he included a high elevation phase in which Holm's sedge is dominant.

Abies lasiocarpa-Picea engelmannii/Ledum glandulosum/Carex scopulorum Association

Subalpine fir-Engelmann spruce/Labrador tea/Holm's sedge Association
4 plots. New type

Ecoregional Range
BM

Environment and Soils

This association occurs in the Wallowa Mountains of the Blue Mountains Ecoregion. Sites are located in narrow to wide U-shaped valleys with moderate to high gradients and gentle to steep sideslopes. Geomorphic surfaces are lake edges, wet forested basin floors and, occasionally, floodplains. Surfaces are hummocky with approximately 30-60 cm height between the top of the hummocks (where the conifers and Labrador tea occur) and the bottom of the swales (where the Holm's sedge occurs). Only one sample site was adjacent to a stream, which is a Rosgen B4 type. Soils have fine-textured, often organic-rich, surface horizons and are generally wet to saturated in swales throughout the growing season. Coarse fragments are very shallow (6 cm) to deeper (70 cm) in the horizon.

Valley Environment	Average	Range
Elevation (ft)	7383	7300-7430
Plot Slope (%)	7	0-20
Valley Width (m)	95	20-200
Valley Gradient (%)	6	2-10
Valley Sideslopes (%)	43	15-70
Local Climate		
Mean Annual Precipitation (in.)	57	41-66
Mean Annual Snowfall (in.)	324	121-430
Mean Annual Temperature (F)	37	34-41
Mean Minimum Temperature (F)	26	23-31
Mean Maximum Temperature (F)	47	45-51
Median Date of Last Spring Freeze	July 2	June 9–July 14
Median Date of First Fall Freeze	Sep. 3	Aug. 28-Sep. 14
Soil Characteristics		
Depth to Wet Soils (cm)	3	0-6
Depth to 80% Coarse Fragments (cm)	42	13-71
Soil Surface Cover (%) – one plot only		
Submerged	3	--
Bare Ground	1	--
Rock	10	--
Cryptogam	40	--
Litter	47	--

Vegetation Composition

Conifers and grouse huckleberry are confined to drier soils on hummock tops. Labrador tea grows down to the base of hummocks. Holm's sedge, few-flowered spikerush, bladder sedge, and bluejoint reedgrass dominate the herbaceous vegetation growing in the swales. Other graminoids and forbs found more commonly in these wet swales include sheep sedge, meadow arnica, and alpine meadow butterweed. The shrub layer average 60 cm in height. The herbaceous layer averages 25 cm in height. Herbaceous biomass averages 1010 lbs/acre, ranging from 400-1408 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Subalpine fir (*Abies lasiocarpa*)	75	7	1-15
Engelmann spruce (*Picea engelmannii*)	75	3	1-5
TREE OVERSTORY-SUBDOMINANTS			
Engelmann spruce (*Picea engelmannii*)	75	2	2-3
Subalpine fir (*Abies lasiocarpa*)	75	2	1-5
TREE UNDERSTORY			
Subalpine fir (*Abies lasiocarpa*)	100	16	4-30
Engelmann spruce (*Picea engelmannii*)	75	3	1-5
Whitebark pine (*Pinus albicaulis*)	75	1	1-2
SHRUBS			
Labrador tea (*Ledum glandulosum*)	100	34	7-50
Grouse huckleberry (*Vaccinium scoparium*)	100	5	2-8
Red mountain-heath (*Phyllodoce empetriformis*)	100	4	1-10
Western wintergreen (*Gaultheria humifusa*)	75	2	1-4
SEDGES and RUSHES			
Holm's sedge (*Carex scopulorum*)	100	40	30-50
Few-flowered spikerush (*Eleocharis quinqueflora)*	75	9	2-20
Bladder sedge (*Carex utriculata*)	50	43	40-45
Sheep sedge (*Carex illota*)	50	3	1-5
Woodrush sedge (*Carex luzulina*)	50	2	1-3
PERENNIAL GRASSES			
Alpine bentgrass (*Agrostis humilis*)	75	1	--
Bluejoint reedgrass (*Calamagrostis canadensis*)	50	11	2-20
Tufted hairgrass (*Deschampsia caespitosa*)	50	1	--
PERENNIAL FORBS			
High mountain cinquefoil (*Potentilla flabellifolia*)	100	19	2-35
Explorer's gentian (*Gentiana calycosa*)	100	1	1-3
Alpine meadow butterweed (*Packera cymbalarioides*)	75	1	--
Idaho licoriceroot (*Ligusticum tenuifolium*)	75	1	--
Fireweed (*Chamerion angustifolium*)	75	1	--
Meadow arnica (*Arnica chamissonis*)	75	1	--

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are:
sideslopes: subalpine fir/Labrador tea, subalpine fir/pokeweed (*Polygonum phytolaccifolium*), and other subalpine fir associations.

Successional Dynamics

These sites are generally stable. A change in soil hydrologic conditions, i.e. a lowering or raising of the water table, would cause a change in community. If water tables lowered, sites would probably change to subalpine fir/Labrador tea associations. If water tables rise, a very gradual die-off of conifers would occur, and the site would probably eventually convert to **a** Holm's sedge association, or if wet enough, a bladder sedge association.

With severe fire that kills the conifers, shrubs will increase in cover and this may result in long term dominance of the site by a Labrador tea-grouse huckleberry/Holm's sedge Association.

Other Studies Documenting Association

none

Abies lasiocarpa/Ledum glandulosum-Vaccinium scoparium Association

Subalpine fir/Labrador tea-grouse huckleberry Association
6 plots. CEGL000341

Ecoregional Range
BM

Environment and Soils

This association occurs at an average elevation of 7159 ft. (ranging from 6040-7510 ft.). Plot slopes average 18% (ranging from 1-40%). Soil moisture is intermediate between the Subalpine fir/Grouse huckleberry Association (see Johnson and Simon 1987) and the Subalpine fir-Engelmann spruce/Labrador tea/Holm's sedge Association, and would probably not be considered a true wetland or riparian association. It is included here because it often occurs in valley bottoms on terrace s and toeslopes adjacent to floodplains, streambanks and wet meadows. Sites are flat to concave.

Valley Environment	Average	Range
Elevation (ft)	7159	6040-7510
Plot Slope (%)	18	1-40
Local Climate		
Mean Annual Precipitation (in.)	67	59-77
Mean Annual Snowfall (in.)	409	376-448
Mean Annual Temperature (F)	35	34-35
Mean Minimum Temperature (F)	24	23-25
Mean Maximum Temperature (F)	45	45-48
Median Date of Last Spring Freeze	July 11	July 6-July 12
Median Date of First Fall Freeze	Aug. 29	Aug. 28-Aug. 30
Soil Surface Cover (%)		
Bare Ground	1	0-3
Gravel	tr	0-1
Rock	9	0-45
Cryptogam	14	0-70
Litter	72	20-95

Vegetation Composition

This association differs from the Subalpine fir-Engelmann spruce/Labrador tea/Holm's sedge Association in that it has a more contiguous conifer canopy.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Subalpine fir (*Abies lasiocarpa*)	86	15	2-35
Engelmann spruce (*Picea engelmannii*)	86	10	5-25
TREE OVERSTORY-SUBDOMINANTS			
Subalpine fir (*Abies lasiocarpa*)	86	8	tr-20
Engelmann spruce (*Picea engelmannii*)	79	3	tr-10
TREE UNDERSTORY			
Subalpine fir (*Abies lasiocarpa*)	100	12	2-25
Engelmann spruce (*Picea engelmannii*)	57	2	1-4
SHRUBS			
Labrador tea (*Ledum glandulosum*)	100	42	5-75
Grouse huckleberry (*Vaccinium scoparium*)	100	46	10-90
Red mountain-heath (*Phyllodoce empetriformis*)	57	4	1-10
SEDGES and RUSHES			
Woodrushes (*Luzula* spp.)	71	11	1-30
PERENNIAL FORBS			
Subalpine daisy (*Erigeron peregrinus* ssp. *callianthemus*)	57	5	1-30
High mountain cinquefoil (*Potentilla flabellifolia*)	57	2	1-6
Green false hellebore (*Veratrum viride*)	57	2	1-5
Heart-leaf arnica (*Arnica cordifolia*)	43	4	1-10
Gray's licoriceroot (*Ligusticum grayi*)	43	1	--
Skunk-leaved polemonium (*Polemonium pulcherrimum*)	36	1	1-3

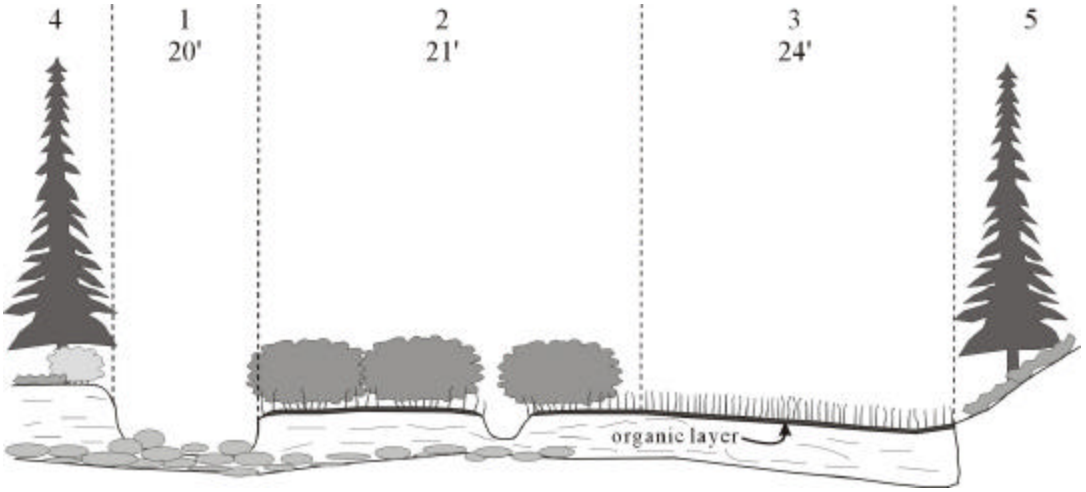
Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are:
sideslopes subalpine fir/grouse huckleberry, lodgepole pine associations and other subalpine fir associations.

Successional Dynamics
These sites are generally stable. With severe fire that kills the conifers, shrubs will increase in cover and this may result in long term dominance of the site by a Labrador tea -grouse huckleberry-dominated association until conifers can become re-established.

Other Studies Documenting Association with Plot Data
Washington: Kovalchik 2001

Illustrations

1 B3 stream reach
2 **Undergreen willow/Holm's sedge**, floodplain
3 **Holm's sedge**, overflow swale
4 **Subalpine fir/Labrador tea-Grouse huckleberry**, terrace
5 Subalpine fir/grouse huckleberry, northeast-facing sideslope



East Lostine River, Eagle Cap RD, Wallowa-Whitman NF; moderate gradient, high elevation, U-shaped valley; Blue Mountains Ecoregion

Abies lasiocarpa/Athyrium filix-femina Association

Subalpine fir/Ladyfern Association
3 plots. New type

Ecoregional Range
BM

Environment and Soils

The Subalpine fir/Lady fern Association was sampled in the northern portions of the Blue Mountains Ecoregion. Sites are located in very narrow V-shaped valleys and headwaters at moderate to moderately high elevations. Valley gradients range from 2% to 10%. It occurs on fluvial surfaces such as streambanks and floodplains with water near the soil surface. These sites flood seasonally with the water table retreating to a 20-50 cm depth by September. Soils are shallow alluvial silts, sands and gravels over cobbles. Depths to the old streambed varied from 23-41 cm. Rosgen stream types associated with sampled sites include A4, A6, and B3 streams. Streams are generally very narrow with 0.5-1.5 m widths.

Valley Environment	Average	Range
Elevation (ft)	5127	4880-5300
Plot Slope (%)	6	3-10
Valley Width (m)	5	--
Valley Gradient (%)	6	2-10
Valley Sideslopes (%)	35	15-45
Soil Characteristics		
Rooting Depth (cm)	18	10-25
Current Water Table Depth (cm)	36	20-51
Depth to 30% Coarse Frags (cm)	17	10-23
Depth to 80% Coarse Frags (cm)	32	23-41
Local Climate		
Mean Annual Precipitation (in.)	44	34-55
Mean Annual Snowfall (in.)	142	133-155
Mean Annual Temperature (F)	43	42-44
Mean Minimum Temperature (F)	33	31-35
Mean Maximum Temperature (F)	53	52-53
Median Date of Last Spring Freeze	June 10	June 4-June 20
Median Date of First Fall Freeze	Sep. 13	Sep. 3-Sep. 22
Soil Surface Cover (%)		
Submerged	8	0-15
Bare Ground	5	0-15
Gravel		-
Rock	1	0-2
Moss	54	26-95
Liverwort	3	0-10
Litter	2	4-52

Vegetation Composition

Subalpine fir dominates the overstory in late seral and climax conditions. Engelmann spruce may dominate subclimax stands but subalpine fir is present and reproducing successfully on these sites. Prickly currant and Sitka alder are occasionally well represented. The herb layer is characterized by the wet-site forb, lady fern, with mean canopy coverage of 48%. Other important forbs include clasp-leaf twistedstalk, false bugbane, brook saxifrage, heart-leaved miner's-lettuce, arrow-leaf groundsel, Columbia monkshood, sweet-scented bedstraw, alpine mitrewort, oneleaf foamflower, and mountain sweet-cicely. Drooping woodreed was a constant understory component. Associated grasses and sedges include Columbia brome, tall mannagrass, and soft-leaved sedge. The shrub layer averages 1.2 m in height. The herbaceous layer averages 76 cm in height. Average herbaceous biomass is 1811 lbs/acre, ranging from 1433-2200 lbs/acre.

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are: terraces - subalpine fir/big huckleberry sideslopes - subalpine fir/big huckleberry, other subalpine fir associations.

Successional Dynamics

The dominance of subalpine fir and Engelmann spruce may shift back and forth over time on a given site with the death of large or multiple trees of one of the species. So long as the site has some subalpine fir in the overstory or regenerating in the understory, a site can be considered a member of this association rather than of the Engelmann spruce/Ladyfern Association.

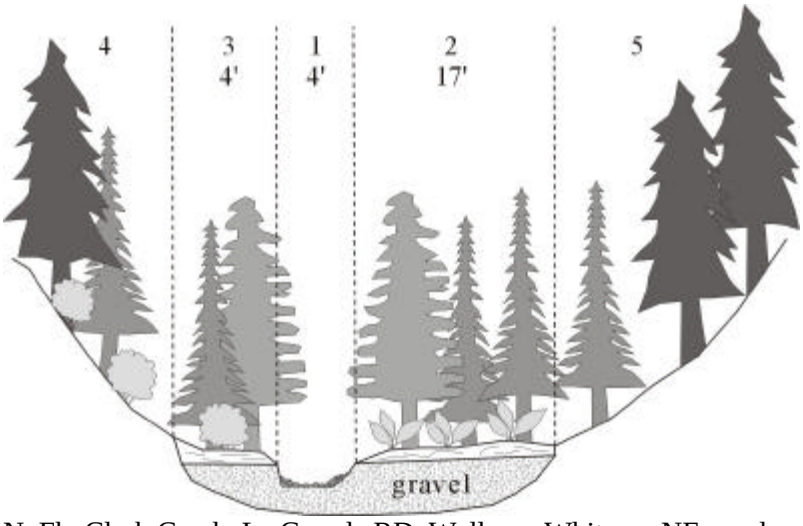
Both of the dominant conifer species are highly susceptible to being killed by even low intensity fires. Following a fire, sites in this association will probably revert to an alder (*Alnus incana* or *Alnus viridis* ssp. *sinuata*) /Ladyfern Association or even to an earlier successional currants-dominanted association, which may be dominant for decades before conifers can become re-established.

A large-scale fluvial event that results in either tremendous scour of fine-textured surface materials will change the site potential, resulting in the change to an alder-dominated association.

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt
Surface Layer	
Thickness (cm)	10
Texture	silt loam, sandy loam
Coarse Fragments (%)	0, gravel
Roots: very fine	none to many
fine	common to many
medium	none to common
coarse	none to few
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	13-31
Texture(s)	silt loam, gravelly sandy loam
Coarse Fragments (%)	0-60, gravel
Roots: very fine	none to many
fine	few to common
Redoximorphic Features	none
Substrate	extremely gravelly sand to alluvial cobble

Illustrations

1 B4 channel reach
2 **Subalpine fir/ladyfern**, floodplain
3 Subalpine fir/big huckleberry, terrace
4 Grand fir/big huckleberry, east-facing sideslope
5 Grand fir, west-facing sideslope



N. Fk. Clark Creek, La Grande RD, Wallowa-Whitman NF; mod. gradient, mod. elevation, V-shaped valley; Blue Mountains Ecoregion

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Subalpine fir (*Abies lasiocarpa*)	67	10	4-15
Engelmann spruce (*Picea engelmannii*)	33	20	--
TREE OVERSTORY-SUBDOMINANTS			
Subalpine fir (*Abies lasiocarpa*)	67	13	6-20
Engelmann spruce (*Picea engelmannii*)	33	3	--
TREE UNDERSTORY			
Engelmann spruce (*Picea engelmannii*)	67	7	3-10
Subalpine fir (*Abies lasiocarpa*)	33	5	--
Grand fir (*Abies grandis*)	33	3	--
SHRUBS			
Prickly currant (*Ribes lacustre*)	100	6	1-16
Sitka alder (*Alnus viridus* spp. *sinuata*)	37	15	5-25
SEDGES and RUSHES			
Soft-leaved sedge (*Carex disperma*)	37	4	3-4
PERENNIAL GRASSES			
Drooping woodreed (*Cinna latifolia*)	100	2	1-3
Columbia brome (*Bromus vulgaris*)	67	8	1-15
Tall mannagrass (*Glyceria striata*)	67	5	2-7
PERENNIAL FORBS			
Claspleaf twistedstalk (*Streptopus amplexifolius*)	100	18	3-40
False bugbane (*Trautvettaria caroliniensis*)	100	13	3-25
Brook saxifrage (*Saxifraga odontoloma*)	100	5	3-8
Heart-leaved miner's lettuce (*Claytonia cordifolia*)	100	4	tr-10
Arrowleaf groundsel (*Senecio triangularis*)	100	4	2-5
Sweet-scented bedstraw (*Galium triflorum*)	100	3	2-5
Alpine mitrewort (*Mitella pentandra*)	100	2	1-5
Oneleaf foamflower (*Tiarella trifoliata* var. *unifoliata*)	100	1	tr-2
Mountain sweet cicily (*Osmorhiza berteroi*)	75	tr	tr-2
Broadleaf bluebells (*Mertensia paniculata*)	67	6	2-10
Columbia monkshood (*Aconitum columbianum*)	67	3	--
Stream violet (*Viola glabella*)	67	2	1-3
Sharptooth angelica (*Angelica arguta*)	67	2	--
FERNS and HORSETAILS			
Ladyfern (*Athyrium filix-femina*)	100	48	18-95

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997
Washington: Kovalchik 2001
Montana: Hansen *et al.* 1995

Abies lasiocarpa/Senecio triangularis-Saxifraga odontoloma Association

Subalpine fir/Arrowleaf groundsel-Brook saxifrage Association
5 plots. CEGL000334

Ecoregional Range
BM, EC

Environment and Soils

The Subalpine fir/Arrowleaf groundsel-brook saxifrage Association is found at moderate to moderately high elevations in the Blue Mountains and East Cascades Ecoregions. Geomorphic surfaces are gravel bars, streambanks, and floodplains in moderate to high gradient, narrow, V-shaped or trough-shaped valleys with gentle to moderately steep sideslopes. Soils reflect the dynamic nature of these streamside habitats: layers of coarse-textured sand and gravels may alternate with fine-textured silt loam and clay loam or buried litter layers. Soil surface cover of rock and gravel averages 14% in this type while the mean coverage for these components is 1% in the Subalpine fir/Ladyfern Association. The water table ranges between 30-60 cm below the surface during the growing season. Rosgen stream types associated with sampled sites include A4, B4 and B4c (low gradient) streams. Streams are narrow with widths of 0.5-4.5 m.

Valley Environment	Average	Range
Elevation (ft)	5414	4640-6490
Plot Slope (%)	6	3-9
Valley Width (m)	20	5-65
Valley Gradient (%)	5	2-7
Valley Sideslopes (%)	38	15-45
Local Climate		
Mean Annual Precipitation (in.)	33	29-41
Mean Annual Snowfall (in.)	117	87-163
Mean Annual Temperature (F)	42	42-43
Mean Minimum Temperature (F)	31	29-32
Mean Maximum Temperature (F)	54	53-54
Median Date of Last Spring Freeze	June 20	June 9-July 3
Median Date of First Fall Freeze	Sep. 6	Sep. 1-Sep. 11
Soil Characteristics		
Rooting Depth (cm)	33	23-46
Current Water Table Depth (cm)	43	30-53
Depth to 30% Coarse Fragments (cm)	20	0-53
Depth to 80% Coarse Fragments (cm)	43	33-53
Soil Surface Cover (%)		
Submerged	8	2-25
Bare Ground	2	0-5
Gravel	8	1-30
Rock	6	0-20
Moss	32	5-89
Liverwort	4	0-15
Lichen	tr	0-1
Litter	39	tr-55

Vegetation Composition

This plant association is dominated by subalpine fir and Engelmann spruce. Some of the plots used to classify this association are examples either of the incipient development of this association on older alluvial bars that are transitioning to floodplains or of sites along streambanks where the conifers are scattered and comprised less than 25% total tree canopy on the plot sites. Stinking swamp currant and prickly currant are well represented to abundant on all sites with the former species dominating the shrub layer. The rich herbaceous layer is characterized by arrowleaf groundsel and brook saxifrage. Mountain sweet cicily, tall mannagrass and drooping woodreed occur in small amounts on all plots. Other important species of the herbaceous layer include brook saxifrage, heart-leaved miner's lettuce, Columbia monkshood, heartleaf arnica, sidebells pyrola, sweet-scented bedstraw, one-leaf foamflower. In contrast to the Subalpine fir/Ladyfern Association with mean moss coverage of 54%, moss cover is 32% in the Subalpine fir/Arrowleaf groundsel-brook saxifrage Association. The shrub overstory averages 0.8 m, ranging from 0.6-0.9 m. The herbaceous layer averages 66 cm in height, ranging from 46-76 cm. Average herbaceous biomass is 653 lbs/acre.

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt, rhyolite
Depth to Redoximorphic Features (cm)	avg.: 33; range: 23-46
Surface Layer	
Thickness (cm)	23-33
Texture(s)	silt loam, loam, gravelly sand
Coarse Fragments (%)	0-30, gravel
Roots very fine	many
fine	many
medium	common
coarse	none to common
Redoximorphic Features	some iron oxidation
Subsurface Layer(s)	
Thickness (cm)	0-25
Texture(s)	loam, fine sand
Coarse Fragments (%)	0-30, gravel
Redoximorphic Features	some iron oxidation
Substrate	alluvial gravel, cobble

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Subalpine fir (*Abies lasiocarpa*)	40	23	15-30
Engelmann spruce (*Picea engelmannii*)	40	9	7-10
TREE OVERSTORY-SUBDOMINANTS			
Engelmann spruce (*Picea engelmannii*)	40	11	6-15
Subalpine fir (*Abies lasiocarpa*)	20	35	--
TREE UNDERSTORY			
Subalpine fir (*Abies lasiocarpa*)	80	5	2-10
Engelmann spruce (*Picea engelmannii*)	40	7	5-9
SHRUBS			
Stinking swamp currant (*Ribes hudsonianum*)	100	21	2-50
Prickly currant (*Ribes lacustre*)	100	16	1-60
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	100	3	tr-8
Drooping woodreed (*Cinna latifolia*)	100	2	tr-7
PERENNIAL FORBS			
Arrowleaf groundsel (*Senecio triangularis*)	100	14	4-40
Brook saxifrage (*Saxifraga odontoloma*)	100	10	tr-35
Mountain sweet cicily (*Osmorhiza berteroi*)	75	tr	tr-2
Heart-leaved miner's lettuce (*Claytonia cordifolia*)	80	11	1-35
Columbia monkshood (*Aconitum columbianum*)	80	2	tr-6
Heartleaf arnica (*Arnica cordifolia*)	80	2	tr-6
Sidebells pyrola (*Orthilia secunda*)	80	2	tr-3
Sweet-scented bedstraw (*Galium triflorum*)	80	1	tr-2
One-leaf foamflower (*Tiarella trifoliata* ssp. *unifoliata*)	60	17	1-45

Adjacent Vegetation
Upland vegetation types adjacent to sampled sites are:
terraces - subalpine fir/twinflower and other subalpine fir associations;
sideslopes - subalpine fir/grouse huckleberry, other subalpine fir associations, and grand fir/Pacific yew/twinflower.

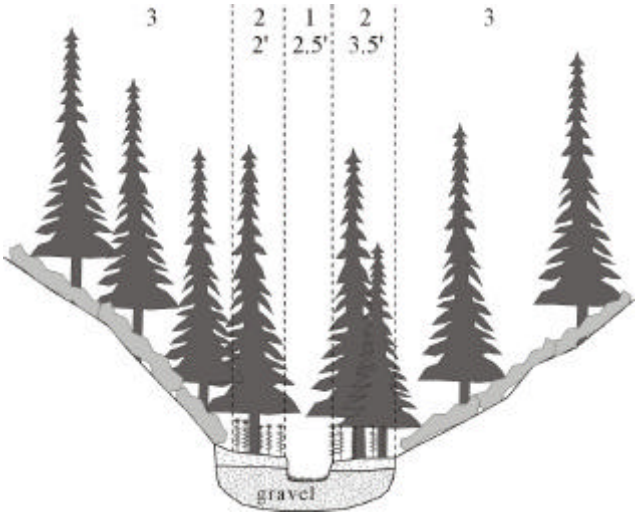
Successional Dynamics

This association may develop from the Gooseberry/Tall mannagrass (*Glyceria striata*) or Gooseberry/ Drooping woodreed (*Cinna latifolia*) Associations. Once fully developed, the association is stable unless and until a fire severe enough to kill conifers occurs. The loss of conifers through fire will allow an increase in total cover and new establish of the currant species. Forb and graminoid species will also increase in cover following fire. Eventually conifer species will become re-established.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997
Washington: Kovalchik 2001

Illustrations



1 A4 stream reach
2 **Subalpine fir/arrowleaf groundsel**, banks and floodplain
3 Subalpine fir/grouse huckleberry, north and south-facing sideslopes

Lookout Creek, Unity RD, Wallowa-Whitman NF; high gradient, moderately high elevation, V-shaped valley; Blue Mountains Ecoregion

Abies lasiocarpa/Calamagrostis canadensis Association

Subalpine fir/Bluejoint reedgrass Association
2 plots. CEGL000300

Ecoregional Range

BM

Environment and Soils

The Subalpine fir/Bluejoint reedgrass Association was sampled only twice at moderate elevations in the Blue Mountains and East Cascades Ecoregion on high floodplains in wide, moderate gradient, V-shaped valleys. One site is adjacent to a Rosgen C3 stream reach. Microrelief is flat and soils have fine-textured, mineral surface horizons and litter is the dominant soil surface cover.

Valley Environment	Average	Range
Elevation (ft)	5200	4600-5800
Plot Slope (%)	2	1-3
Valley Width (m)	200	--
Valley Gradient (%)	2	--
Valley Sideslopes (%)	45	--
Local Climate		
Mean Annual Precipitation (in.)	42	29-54
Mean Annual Snowfall (in.)	166	98-234
Mean Annual Temperature (F)	42	41-42
Mean Minimum Temperature (F)	30	29-32
Mean Maximum Temperature (F)	53	53-54
Median Date of Last Spring Freeze	June 24	June 18-June 30
Median Date of First Fall Freeze	Sep. 3	Aug. 30-Sep. 7
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	8	0-15
Gravel	-	-
Rock	tr	0-1
Cryptogam	18	15-20
Litter	75	70-79

Vegetation Composition

Both the tree overstory and understories consist of a scattered layers of subalpine fir, lodgepole pine, Engelmann spruce and, in the East Cascades, mountain hemlock. Shrubs are scarce. Bluejoint reedgrass dominates the herbaceous layer. Associated graminoids include small-flowered woodrush, thick-headed sedge, blue wildrye, alpine timothy and western fescue. Arrowleaf groundsel, yarrow, broadpetal strawberry, common cowparsnip and fringed grass-of-Parnassus are the most common forbs. Herbaceous biomass averages 2870 lbs/acre.

Adjacent Vegetation

Upland vegetation adjacent to sites sampled are subalpine fir and mountain hemlock associations.

Successional Dynamics

Early season grazing during periods with saturated soil conditions can churn the soil, decrease plant cover, and limit conifer regeneration. Recurrent, severe grazing results in decline of bluejoint reedgrass (Hansen *et al*. 1995).

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Lodgepole pine (*Pinus contorta*)	50	5	--
TREE OVERSTORY-SUBDOMINANTS			
Subalpine fir (*Abies lasiocarpa*)	50	15	--
Lodgepole pine (*Pinus contorta*)	50	15	--
Engelmann spruce (*Picea engelmannii*)	50	5	--
Mountain hemlock (*Tsuga mertensiana*)	50	5	--
TREE UNDERSTORY			
Engelmann spruce (*Picea engelmannii*)	100	11	2-20
Lodgepole pine (*Pinus contorta*)	100	7	2-11
Subalpine fir (*Abies lasiocarpa*)	100	5	2-7
Mountain hemlock (*Tsuga mertensiana*)	50	2	--
Western larch (*Larix occidentalis*)	50	2	--
SHRUBS			
Stinking swamp currant (*Ribes hudsonianum*)	50	18	--
SEDGES and RUSHES			
Small-flowered woodrush (*Luzula parviflora*)	100	tr	tr-1
Thick-headed sedge (*Carex pachystachya*)	50	15	--
PERENNIAL GRASSES			
Bluejoint reedgrass (*Calamagrostis canadensis*)	100	33	15-50
Blue wildrye (*Elymus glaucus*)	100	8	tr-15
Alpine timothy (*Phleum alpinum*)	100	5	tr-10
Western fescue (*Festuca occidentalis*)	100	tr	--
PERENNIAL FORBS			
Arrowleaf groundsel (*Senecio triangularis*)	100	8	tr-15
Yarrow (*Achillea millefolium*)	100	4	2-5
Broadpetal strawberry (*Fragaria virginiana*)	100	4	2-5
Common cowparsnip (*Heracleum maximum*)	100	2	tr-4
Fringed grass-of-Parnassus (*Parnassia fimbriata*)	100	2	tr-3
Peavines (*Lathryus* spp.)	50	15	--
Big-leaf lupine (*Lupinus polyphyllus*)	50	15	--
Tall bluebells (*Mertensia ciliata*)	50	15	--

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997; 38
Idaho: Steele *et al.* 1981; Steele *et al.* 1983
Montana: Pfister *et al.* 1977
Utah: Mauk and Henderson (1984)
Colorado: *Hansen et al.* (1995).

Picea engelmannii/Athyrium filix-femina Association

Engelmann spruce/Ladyfern Association
5 plots. New type

Ecoregional Range
BM, EC

Environment and Soils

The Engelmann spruce/Lady fern Association is found at moderate elevations in the grand fir and white fir zones of the Blue Mountains and East Cascades Ecoregions. Sites sampled were floodplains located in very narrow to narrow V-shaped valleys with moderately high gradients and gentle to steep sideslopes. Soils generally consist of silt loam over sandy loam, gravels, cobbles, and stones. The mean thickness of the fine-textured material was 30 cm. These sites are seasonally flooded or saturated to the surface. The water table drops to 20-46 cm during the growing season. Adjacent streams are 1.5 to 9 m wide and classified as A3, B3, C2 and C4 stream types.

Valley Environment	Average	Range
Elevation (ft)	4264	3880-4700
Plot Slope (%)	3	0-5
Valley Width (m)	20	--
Valley Gradient (%)	5	--
Valley Sideslopes (%)	52	15-70
Local Climate		Range
Mean Annual Precipitation (in.)	46	34-59
Mean Annual Snowfall (in.)	164	99-263
Mean Annual Temperature (F)	43	42-44
Mean Minimum Temperature (F)	32	29-34
Mean Maximum Temperature (F)	54	49-58
Median Date of Last Spring Freeze	June 15	June 5-June 29
Median Date of First Fall Freeze	Sep. 9	Aug. 26-Sep. 16
Soil Characteristics		
Rooting Depth (cm)	28	15-40
Depth to 30% Coarse Fragments (cm)	20	0-40
Depth to 80% Coarse Fragments (cm)	46	0-91
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	-	-
Gravel	-	-
Rock	1	0-5
Cryptogam	18	0-40
Litter	81	60-100

Vegetation Composition

Stands are dominated by a scattered to dense overstory of Engelmann spruce. Other conifers are scarce; small amounts grand fir, white fir, black cottonwood and Douglas fir occur in the understory. Western thimbleberry is present on all sites. Prickly currant and Sitka alder are occasionally abundant shrubs. Common snowberry was an important component only on less active floodplains. The understory is characterized by the wet-site herb, lady fern, with mean canopy coverage of 46%. Other important herbaceous species include clasping twistedstalk, common cowparsnip, enchanter's nightshade, brook saxifrage, sweet-scented bedstraw, one-leaf foam-flower, alpine mitrewort, stream violet, baneberry. Oakfern's presence is related to occurrences of the relatively drier Grand fir/Oak fern Association on adjacent sites. Associated grasses include drooping woodreed and Columbia brome. Height of shrub layer averages 3.7 m. Average height of herbaceous layer is 91 cm. Average herbaceous biomass is 1867 lbs/acre, ranging from 1767-1967 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Engelmann spruce (*Picea engelmannii*)	100	38	15-70
TREE OVERSTORY-SUBDOMINANTS			
White fir (*Abies concolor*)	40	10	5-15
Black cottonwood (*Populus balsamifera* spp. *trichocarpa*)	40	10	5-15
Douglas fir (*Pseudotsuga menziesii*)	20	15	--
TREE UNDERSTORY			
Engelmann spruce (*Picea engelmannii*)	40	3	2-3
White fir (*Abies concolor*)	40	2	--
Grand fir (*Abies grandis*)	20	2	--
SHRUBS			
Thimbleberry (*Rubus parviflorus*)	100	4	1-8
Prickly currant (*Ribes lacustre*)	88	6	3-15
Common snowberry (*Symphoricarpos albus*)	40	17	2-35
Wood's rose (*Rosa woodsii*)	40	3	1-5
Bearberry honeysuckle (*Lonicera involucrata*)	40	1	--
PERENNIAL GRASSES			
Drooping woodreed (*Cinna latifolia*)	80	2	tr-4
PERENNIAL FORBS			
Sweet-scented bedstraw (*Galium triflorum*)	100	3	tr-5
Clasping twistedstalk (*Streptopus amplexifolius*)	80	6	tr-15
Common cowparsnip (*Heracleum maximum*)	80	3	tr-8
Enchanter's nightshade (*Circaea alpina*)	80	3	tr-5
Mountain sweet cicily (*Osmorhiza berteroi*)	75	tr	tr-2
One-leaf foamflower (*Tiarella trifoliata* ssp. *unifoliata*)	60	8	7-10
Alpine mitrewort (*Mitella pentandra*)	60	8	tr-15
Feathery Solomonplume (*Maianthemum racemosa*)	60	8	3-15
Queen's cup beadlily (*Clintonia uniflora*)	60	7	tr-15
Stream violet (*Viola glabella*)	60	4	2-5
Columbia monkshood (*Aconitum columbianum*)	60	2	1-5
Arrowleaf groundsel (*Senecio triangularis*)	60	2	tr-3
Baneberry (*Actaea rubra*)	60	2	tr-2
Brook saxifrage (*Saxifraga odontoloma*)	60	1	1-2
Piper's anemone (*Anemone piperi*)	60	tr	tr-1
FERNS and HORSETAILS			
Ladyfern (*Athyrium filix-femina*)	100	46	15-90

Adjacent Vegetation

Upland vegetation types adjacent to site sampled are: Terraces: grand fir/Pacific yew/queen's cup beadlily; white fir associations. Sideslopes: grand fir/Rocky Mountain maple, grand fir/Pacific yew/twinflower or queen's cup beadlily and other grand fir associations, white fir association

Successional Dynamics

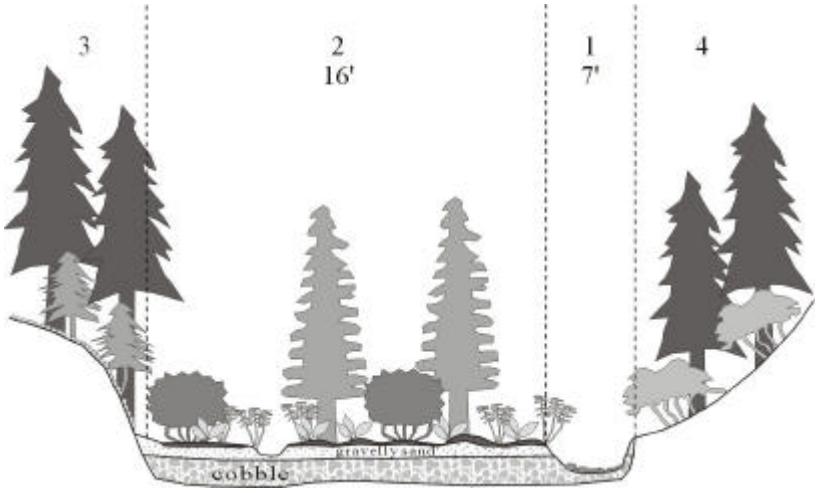
The dominance of grand or white fir and Engelmann spruce may shift back and forth over time on a given site with the death of large or multiple trees of one of the species.

The dominant conifer species are highly susceptible to being killed by low to moderate intensity fires. Following a fire, sites in this association may revert to an alder (*Alnus incana* or *Alnus viridis* ssp. *sinuata*) / Ladyfern Association but are more likely to be dominated by currants, thimbleberry, common snowberry, Wood's rose, bearberry honeysuckle and other shrubs with ladyfern and a variety of other forbs dominating the understory until conifers can become re-established

A large-scale fluvial event that results in heavy scour of fine-textured surface materials may change the site potential, resulting in the change to an alder-dominated association.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997: 42

Illustrations



1 A4 stream reach
2 **Engelmann spruce/ladyfern**, floodplain
3 Grand fir/Pacific yew/twinflower, south-facing sideslope
4 Grand fir/Rocky Mountain maple, north-facing sideslope

Coombs Creek, Pomeroy RD, Umatilla NF; very high gradient, moderately low elevation, V-shaped valley; Blue Mountains Ecoregion

Picea engelmannii/Senecio triangularis Association

Engelmann spruce/Arrowleaf groundsel Association
4 plots. CEGL000376

Ecoregional Range
BM, EC?

Environment and Soils
The Engelmann spruce/Arrowleaf groundsel Association is known from the northern and central portions of the Blue Mountains Ecoregion but may also occur in the East Cascades Ecoregion. It is found on mid-elevation bars, floodplains, and springs. Sampled sites are in moderate to moderately high gradient, very narrow to broad, generally, trough-shaped valleys with gentle to moderately steep sideslopes. This association develops on coarse alluvial deposits of sands, gravels, cobbles, and boulders. Silt loam or sandy loam is usually deposited on top of these coarse layers. Mean depth to the water table is 25 cm in June-July; the spring was wet the entire growing season. Soil surface cover of rock and gravel approaches 20% in this type. By contrast, the Engelmann spruce/Ladyfern Association has a mean coverage of 2% rock and gravel. Rosgen stream types of B3 and C3 are associated with sampled areas. Stream widths vary from 1.5 to 5 m.

Vegetation Composition

Engelmann spruce was the sole overstory tree with an occasional lodgepole pine, Douglas fir, or grand fir in the understory. Spruce regeneration was scattered in stands but abundant where a light spruce overstory was present. Prickly currant is present on all sites. Mountain alder, stinking swamp currant, red-osier dogwood, and baldhip rose are frequent understory shrubs. The diverse understory is characterized by the wet-site forb, arrowleaf groundsel, with mean canopy coverage of 48%. Other important forbs include sweet-scented bedstraw, brook saxifrage, clasping leaf twistedstalk, Columbia monkshood, American speedwell, Fringed grass-of-Parnassus, heart-leaved miner's-lettuce, common cowparsnip, sharptooth angelica, and western meadowrue. Frequent grass and sedge components include drooping woodreed, Columbia brome, and soft-leaved sedge. Height of the shrub layer averages 0.9 m. Height of the herbaceous layer averages 102 cm, ranging from 91-122 cm. Average herbaceous biomass is 1878 lbs/acre, ranging from 567-3967 lbs/acre.

Valley Environment	Average	Range
Elevation (ft)	5022	4800-5270
Plot Slope (%)	5	3-6
Valley Width (m)	95	20-200
Valley Gradient (%)	5	2-7
Valley Sideslopes (%)	35	15-45
Local Climate		Range
Mean Annual Precipitation (in.)	27	22-29
Mean Annual Snowfall (in.)	89	53-110
Mean Annual Temperature (F)	43	42-43
Mean Minimum Temperature (F)	32	31-33
Mean Maximum Temperature (F)	53	51-54
Median Date of Last Spring Freeze	June 12	June 5-June 25
Median Date of First Fall Freeze	Sep. 11	Sep. 8-Sep. 17
Soil Characteristics		
Current Water Table Depth (cm)	22	20-23
Depth to 80% Coarse Fragments (cm)	8	0-23
Soil Surface Cover (%)		
Submerged	3	0-10
Bare Ground	4	1-7
Gravel	13	0-40
Rock	5	0-14
Bedrock	4	0-14
Moss	48	15-90
Liverwort	2	0-8
Litter	26	7-65

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are:
terraces - Engelmann spruce/twinflower,
sideslopes - grand fir/grouse huckleberry, grand fir/pinegrass, grand fir/twinflower and bluebunch wheatgrass-Sandberg's bluegrass.

Successional Dynamics

The frequent occurrence of mountain alder and currant species demonstrates that this association in probably in transition from the Mountain alder-prickly current-stinking swamp currant Association. As sites receive more fine-textured floodplain materials, the site potential may change to another Engelmann spruce association such as Engelmann spruce/Queen's cup beadlily.

Severe fires that kill the spruce overstory will leave the Mountain alder-prickly current-stinking swamp currant Association as the dominant on the site again. Flood scour that removes fine-textured surface materials, especially following a severe fire, will transition the site back to a Mountain alder-prickly current-stinking swamp currant Association until the floodplain starts rebuilding and provides establishment sites for Engelmann spruce.

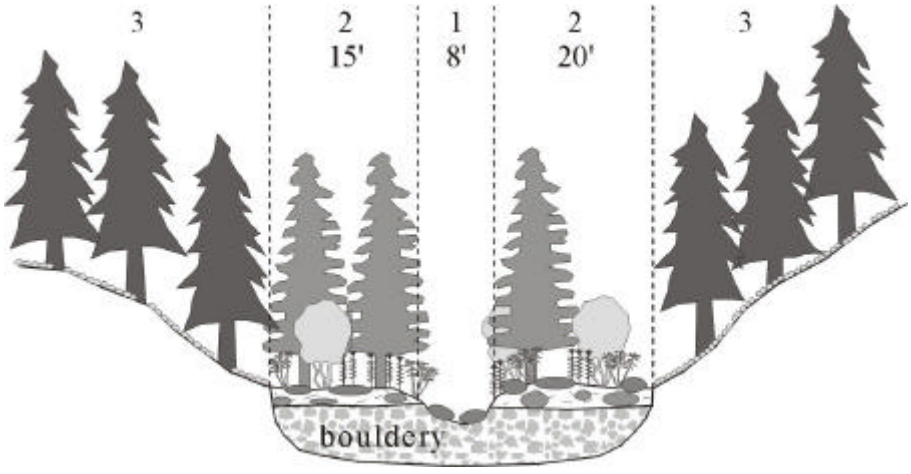
Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Engelmann spruce (*Picea engelmannii*)	75	27	10-40
TREE OVERSTORY-SUBDOMINANTS			
Engelmann spruce (*Picea engelmannii*)	50	12	8-15
TREE UNDERSTORY			
Grand fir (*Abies grandis*)	75	3	2-4
Engelmann spruce (*Picea engelmannii*)	50	35	--
SHRUBS			
Prickly currant (*Ribes lacustre*)	100	8	tr-25
Mountain alder (*Alnus incana*)	75	25	1040
Stinking swamp currant (*Ribes hudsonianum*)	75	14	5-25
Red-osier dogwood (*Cornus sericea* spp. *sericea*)	50	8	5-10
SEDGES and RUSHES			
Soft-leaved sedge (*Carex disperma*)	50	5	--
PERENNIAL GRASSES			
Drooping woodreed (*Cinna latifolia*)	75	6	1-15
Columbia brome (*Bromus vulgaris*)	75	2	1-3
PERENNIAL FORBS			
Arrowleaf groundsel (*Senecio triangularis*)	100	48	25-85
Sweet-scented bedstraw (*Galium triflorum*)	100	6	tr-20
Brook saxifrage (*Saxifraga odontoloma*)	100	4	1-5
American speedwell (*Veronica americana*)	100	2	tr-5
Sidebells pyrola (*Orthilia secunda*)	100	2	tr-3
Large-leaf avens (*Geum macrophyllum*)	100	1	tr-2
Heart-leaved miner's lettuce (*Claytonia cordifolia*)	75	9	2-20
Common cowparsnip (*Heracleum maximum*)	75	3	2-5
Columbia monkshood (*Aconitum columbianum*)	75	3	1-5
Western meadowrue (*Thalictrum occidentale*)	75	3	tr-4
Fringed grass-of-Parnassus (*Parnassia fimbriata*)	75	2	tr-5
Alpine mitrewort (*Mitella pentandra*)	75	1	1-2
Clasping twistedstalk (*Streptopus amplexifolius*)	75	1	1-2

Illustrations

1 A2 stream reach
2 **Engelmann spruce/arrowleaf groundsel**, banks and floodplain
3 Grand fir/twinflower, north and south-facing sideslopes



McCully Fork, Baker RD, Wallowa-Whitman NF; moderately steep, moderately high elevation, trough-shaped valley; Blue Mountains Ecoregion

Picea engelmannii/Equisetum arvense Association

Engelmann spruce/Common horsetail Association
6 plots. CEGL000363

Ecoregional Range
BM, EC

Environment and Soils

The Engelmann spruce/Common horsetail Association is found at moderate elevations in the Blue Mountains and East Cascades Ecoregion. Geomorphic surfaces are wet, low gradient, poorly drained floodplains. Valleys are low gradient, wide and generally trough-shaped with moderate sideslopes. Soils range from histosols to deep organic loam to fine sandy loam alluvium. On mineral soils there is often a thick layer of humus on the soil surface. The sites are very wet and the available water holding capacity is moderate to high. The water table is near or slightly above the soil surface much of the growing season and is within 45 cm of the soil surface in September. Adjacent Rosgen stream reach types are B4c and C4.

Valley Environment	Average	Range
Elevation (ft)	4702	4100-5460
Plot Slope (%)	3	0-5
Valley Width (m)	275	200-350
Valley Gradient (%)	3	1-5
Valley Sideslopes (%)	45	--
Local Climate		
Mean Annual Precipitation (in.)	43	26-59
Mean Annual Snowfall (in.)	197	118-270
Mean Annual Temperature (F)	42	37-43
Mean Minimum Temperature (F)	29	27-32
Mean Maximum Temperature (F)	54	48-58
Median Date of Last Spring Freeze	June 28	June 22-July 2
Median Date of First Fall Freeze	Sep. 1	Aug. 25-Sep. 9
Soil Characteristics		
Current Water Table Depth (cm)	46	28-80
Depth to 30% Coarse Fragments (cm)	18	0-36
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	3	0-15
Gravel	tr	0-2
Rock	-	-
Cryptogam	13	0-37
Litter	84	48-100

Vegetation Composition

Engelmann spruce is climax and dominates the overstory in most stands while subalpine fir is climax only at Soda Creek (5400 feet). Lodgepole pine, grand fir and white fir are uncommon and located on dry microsites or on the dry fringe of the site. Minor amounts of mountain alder prickly currant, twinflower, bearberry honeysuckle and serviceberry were present in the shrub understory. The herbaceous flora is rich and varied. Common horsetail is dominant. Graminoids include small-fruit bulrush, tall mannagrass, and soft-leaved sedge. Sweet-scented bedstraw, Columbia monkshood and either clasping leaf or rosy twistedstalk are present on all stands. Other forbs include alpine mitrewort, Queen's cup beadlily, Great North aster, mountain sweet cicely, sidebells pyrola, starry false-Solomon's seal, large-leaf avens and stream violet. The height of the shrub layer averages 0.8 m, ranging from 0.6-0.9 m. Herbaceous biomass averages 383 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Engelmann spruce (*Picea engelmannii*)	100	44	25-65
Grand fir (*Abies grandis*)	17	35	--
TREE OVERSTORY-SUBDOMINANTS			
White fir (*Abies concolor*)	33	10	5-15
Engelmann spruce (*Picea engelmannii*)	33	8	5-10
Grand fir (*Abies grandis*)	17	10	--
TREE UNDERSTORY			
Engelmann spruce (*Picea engelmannii*)	100	3	tr-5
Grand fir (*Abies grandis*)	50	4	tr-5
White fir (*Abies concolor*)	33	3	2-3
SHRUBS			
Prickly currant (*Ribes lacustre*)	67	3	1-5
Mountain alder (*Alnus incana*)	50	8	3-15
Twinflower (*Linnaea borealis*)	50	7	1-15
Bearberry honeysuckle (*Lonicera involucrata*)	50	2	tr-5
Serviceberry (*Amalanchior alnifolia*)	50	2	tr-3
SEDGES and RUSHES			
Small-fruit bulrush (*Scirpus microcarpus*)	83	13	2-37
Soft-leaved sedge (*Carex disperma*)	67	6	tr-20
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	50	21	10-37
PERENNIAL FORBS			
Sweet-scented bedstraw (*Galium triflorum*)	100	2	tr-5
Columbia monkshood (*Aconitum columbianum*)	100	tr	tr-1
Sidebells pyrola (*Orthilia secunda*)	83	tr	tr-1
Great North aster (*Canadanthus modestus*)	67	6	1-15
Queen's cup beadlily (*Clintonia uniflora*)	67	2	tr-5
Alpine mitrewort (*Mitella pentandra*)	67	2	tr-5
Claspleaf twistedstalk (*Streptopus amplexifolius*)	67	1	tr-2
Mountain sweet cicily (*Osmorhiza berteroi*)	75	tr	tr-2
Pink wintergreen (*Pyrola asarifolia*)	50	8	3-15
Starry false Solomon's seal (*Maianthmum stellata*)	50	3	tr-5
Large-leaf avens (*Geum macrophyllum*)	50	2	1-5
Stream violet (*Viola glabella*)	50	2	tr-5
Rosy twistedstalk (*Streptopus lanceolatus var. roseus*)	50	tr	--
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	100	48	25-65

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are: true fir-hemlock forest (in the East Cascades) and white fir and grand fir associations,

Successional Dynamics

Natural fires are probably infrequent on this association as indicated by extreme ages (200 to 300) years of fire sensitive Engelmann spruce on sites sampled. Burned stands may experience some raising of the water table but sites should continue to support the Engelmann spruce/Common horsetail Association.

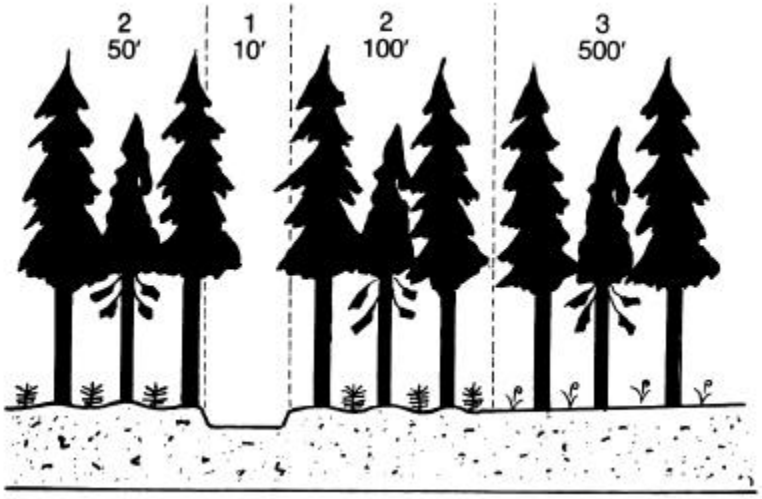
Other Studies Documenting Association without Plot Data

Idaho and western Wyoming: Steele *et al.* 1981, 1983
Montana: Pfister *et al.* 1977

Other Studies Documenting Association with Plot Data
Oregon: Kovalchik 1987: 57; Crowe and Clausnitzer 1997:46
Washington: Kovalchik 2001
Montana: Hansen *et al.* 1995
Utah: Mauk and Henderson 1984

Illustrations

1 Sevenmile Creek, third-order
2 **Engelmann spruce/common horsetail**, active floodplain
3 **Engelmann spruce/Queen's cup beadlily**, inactive floodplain



Sevenmile Creek; low gradient, low elevation floodplain; East Cascades Ecoregion

Picea engelmannii/Carex disperma Association

Engelmann spruce/Soft-leaved sedge Association
4 plots. CEGL000358

Ecoregional Range
BM, EC

Environment and Soils

This association is similar to the Engelmann spruce/Common horsetail Association except that soils on these sites are wetter for longer periods during the growing season because the geomorphic surfaces are generally abandoned by fluvial actions of the adjacent stream and receive no regular sediment input from flooding, i.e. abandoned floodplains. Sites are slightly hummocky. Valleys are low to moderate gradient, very narrow to moderately wide, V-, flat- and trough-shaped with gentle to moderately steep sideslopes. Soils are composed of fine-textured mineral materials with thin organic upper horizons, which are not developed enough to be classified as Histosols. Redoximorphic features were seen in only two horizons (at 8 and 2.5 cm depth) and may be masked by organic materials in the other two. Coarse fragments are deep to absent in all but one horizon. Adjacent Rosgen stream reach types are B5, C4, E4 and E6.

Valley Environment	Average	Range
Elevation (ft)	5338	4900-6010
Plot Slope (%)	3	tr-8
Valley Width (m)	28	5-65
Valley Gradient (%)	4	2-7
Valley Sideslopes (%)	30	15-45
Soil Characteristics		
Thickness of Surface Organic Layer (cm)	10	8-15
Rooting Depth (cm)	42	13-76
Current Water Table Depth (cm)	46	20-76
Depth to 30% Coarse Fragments (cm)	60	28-77
Depth to 80% Coarse Fragments (cm)	60	28-77
Local Climate		
Mean Annual Precipitation (in.)	31	27-35
Mean Annual Snowfall (in.)	110	75-133
Mean Annual Temperature (F)	43	42-43
Mean Minimum Temperature (F)	31	31-32
Mean Maximum Temperature (F)	54	53-55
Median Date of Last Spring Freeze	June 22	June 17-June 27
Median Date of First Fall Freeze	Sep. 6	Sep.3-Sep. 8
Soil Surface Cover (%)		
Submerged	4	0-15
Bare Ground	12	3-30
Gravel	2	0-4
Rock	-	-
Moss	62	50-75
Liverwort	2	0-5
Lichen	tr	0-tr
Litter	18	9-31

Vegetation Composition

Engelmann spruce dominates the conifer overstory and is usually present in the regeneration layer. Conifers are confined to the low hummocks found on these sites. Mountain alder is present in all stands, and one plot had very high alder cover (95%) and is probably an incipient member of this association. Currant species and twinflower, which is confined to hummocks under conifers, are also common associates. Soft-leaved sedge and/or smooth-stemmed sedge dominate the herbaceous understory. Tall mannagrass is present on all sites, sometimes in great abundance. American speedwell and large-leaf avens are present on all sites joined by a wide variety of other forbs including: violets, starry false-Solomon's seal, sweet-scented bedstraw, sidebells pyrola, baneberry, musk monkeyflower, pink wintergreen, heart-leaf arnica, mountain sweet-cicily, stream buttercup and hairy willow-herb. Moss cover is very high, ranging from 50-75%. Average height of the shrub layer is 1.7 m, ranging from 0.9-3.7 m. Average height of herbaceous layer is 32 cm, ranging from 15-51 cm. Herbaceous biomass averages 567 lbs/acre, ranging from 400-667 lbs/acre.

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are:
terraces – lodgepole pine-grand fir/grouse huckleberry/pinegrass;
sideslopes – grand fir/big huckleberry, grand fir/twinflower, lodgepole pine-grand fir/grouse huckleberry, subalpine fir/grouse huckleberry, lodgepole pine-subalpine fire/grouse huckleberry/pinegrass and subalpine fir/big huckleberry.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Engelmann spruce (*Picea engelmannii*)	75	28	5-40
TREE UNDERSTORY			
Engelmann spruce (*Picea engelmannii*)	50	17	9-25
Subalpine fir (*Abies lasiocarpa*)	25	4	--
SHRUBS			
Mountain alder (*Alnus incana*)	100	37	1-95
Stinking swamp currant (*Ribes hudsonianum*)	75	18	tr-32
Prickly currant (*Ribes lacustre*)	75	4	1-10
Twinflower (*Linnaea borealis*)	75	6	3-8
Big huckleberry (*Vaccinium membranaceum*)	50	6	tr-11
SEDGES and RUSHES			
Soft-leaved sedge (*Carex disperma*)	100	31	10-35
Smooth-stemmed sedge (*Carex laeviculmis*)	50	23	15-30
Smallwing sedge (*Carex microptera*)	50	1	--
Woodrush sedge (*Carex luzulina*)	50	tr	--
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	100	23	3-45
Columbia brome (*Bromus vulgaris*)	75	5	tr-12
Spike bentgrass (*Agrostis exarata*)	50	tr	tr-1
PERENNIAL FORBS			
American speedwell (*Veronica americana*)	100	2	tr-5
Large-leaf avens (*Geum macrophyllum*)	100	2	tr-3
Violets (*Viola* spp.)	75	5	2-10
Starry false Solomon's seal (*Maianthemum stellata*)	75	4	tr-10
Sweet-scented bedstraw (*Galium triflorum*)	75	2	tr-3
Sidebells pyrola (*Orthilia secunda*)	75	2	tr-3
Baneberry (*Actaea rubra*)	75	2	tr-3
Musk monkeyflower (*Mimulus moschatus*)	75	1	tr-3
Pink wintergreen (*Pyrola asarifolia*)	75	1	tr-2
Heartleaf arnica (*Arnica cordifolia*)	75	1	tr-2
Mountain sweet cicily (*Osmorhiza berteroi*)	75	tr	tr-2
Columbia monkshood (*Aconitum columbianum*)	75	tr	tr-1
Stream buttercup (*Ranunculus uncinatus*)	75	tr	tr-1
Hairy willow-herb (*Epilobium ciliatum*)	75	tr	tr-1

Successional Dynamics

This association appears to develop from the Mountain alder-prickly currant-stinking swamp currant Association. Once conifers have become established the composition of this association is generally stable, except for the abundance of mountain alder, which will probably decrease with increasing shade by spruce. Severe fires that kill conifers would probably result in an increase in shrub species.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1997: 38, 46

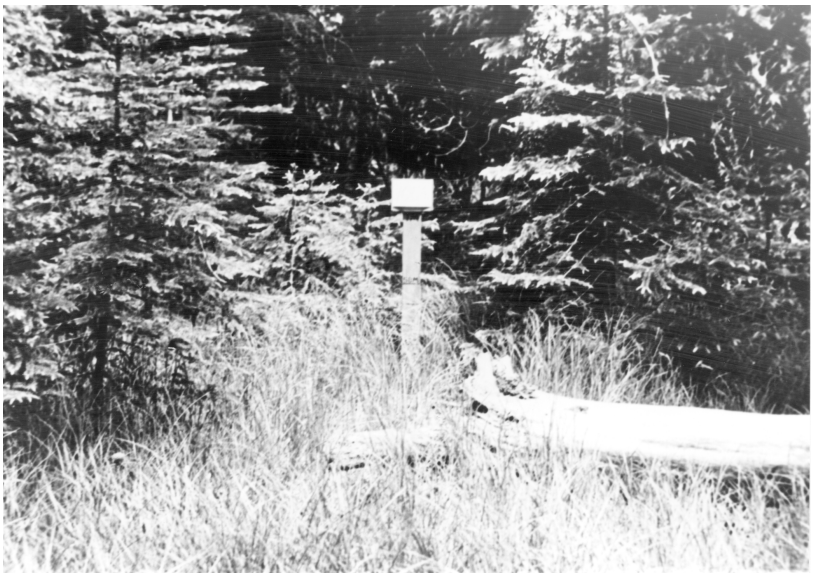
Washington: Kovalchik (2001) includes plots that would fit this association in his Engelmann spruce/Common horsetail Association.

Other Studies Documenting Association without Plot Data

Idaho: Steele *et al.* 1981, 1983

Picea engelmannii/Carex angustata Association

Engelmann spruce/Widefruit sedge Association
10 plots. CEGL000359



Ecoregional Range
EC

Environment and Soils
The Engelmann spruce/Widefruit sedge Association is abundant on the flanks of the Cascades in the East Cascades Ecoregion. Landforms supporting this association occur at moderate to moderately high elevations on flat, wet floodplains and the margins of lakes, marshes, bogs, and forested basins. Microtopography is flat to slightly undulating. The association is replaced by the Lodgepole pine/Widefruit sedge Association below the elevational and cold air limits of Engelmann spruce. Sample stands were located at Sevenmile and Cherry Creeks on the Winema National Forest and Soda Creek, Lava Lake, and Squaw Creek Marsh on the Deschutes National Forest. Soils are variable. On floodplains and the margins of lakes the surface horizons are sandy loams or organic loams developed from pumice, andesite, or basalt alluvium. On the edges of bogs and in wet forest basins the surface texture is organic loam or sedge peat more typical of marsh soils. Available water holding capacity is moderate to high. Maximum water tables are near or slightly flood the soil surface, except on tree hummocks. The water table is within 60 cm of the soil surface in September. Soils are moist through the summer. The local climate for this association is much wetter (more annual precipitation and more annual snowfall), has a longer frost-free period, and has more moderate temperature extremes than the Lodgepole pine/Widefruit sedge Association.

Valley Environment	Average	Range
Elevation (ft)	4678	4250-5800
Plot Slope (%)	4	0-20
Valley Gradient (%)	4	1-20
Local Climate		
Mean Annual Precipitation (in.)	50	32-67
Mean Annual Snowfall (in.)	210	106-337
Mean Annual Temperature (F)	43	40-44
Mean Minimum Temperature (F)	31	28-32
Mean Maximum Temperature (F)	54	52-56
Median Date of Last Spring Freeze	June 29	June 22-July 5
Median Date of First Fall Freeze	Sep. 3	Aug. 28-Sep. 9
Soil Characteristics		
Current Water Table Depth (cm)	30	0-50
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	8	0-60
Gravel or Rock	-	-
Cryptogam	19	0-70
Litter	73	30-100

Vegetation Composition
Engelmann spruce dominates other conifers. Lodgepole pine dominates seral stands. Subalpine fir (*Abies lasiocarpa*) is a minor dominant at higher elevations. The ground cover is a dense sward of widefruit sedge. Occasionally, soft-leaved sedge is dominant on the dry edge of the association. Where the association is grading into bogs and marshes, conifers are somewhat stunted and scattered and bladder sedge (*Carex utriculata*) may be co-dominant with widefruit sedge. One plot at the upper elevation limits of the association had Holm's sedge (*Carex scopulorum*) co-dominant with widefruit sedge. Tall mannagrass, bluejoint reedgrass (*Calamagrostis canadensis*), and slimstem reedgrass (*Calamagrostis stricta*) are often present but are low in cover. The forb layer includes wet site species such as common horsetail, arrowleaf groundsel, white bog-orchid, and stream buttercup (*Ranunculus uncinatus*). Mesic forbs characteristic of the Engelmann spruce/Queen's cup beadlily Association such as queen's cup beadlily, sweet-scented bedstraw, broadpetal strawberry, pyrola, and violets (*Viola* spp.) occur on drier microsites and hummocks.

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are white fir, fir-hemlock, and mountain-hemlock associations.

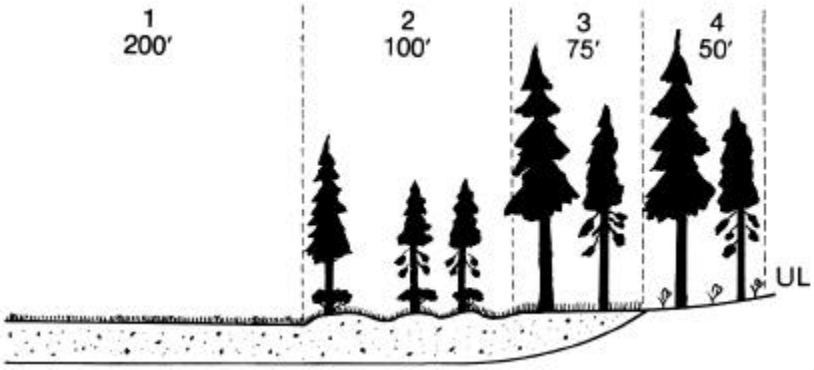
Successional Dynamics
Burned stands regenerate to lodgepole pine. The herbaceous composition will remain unchanged. Burned stands may experience a temporary elevation of the water table and an increase in the cover of sedges and willows.

Other Studies with Plot Data
Oregon: Kovalchik 1987

Other Studies without Plot Data
Idaho: Steele et al. 1981, 1983.

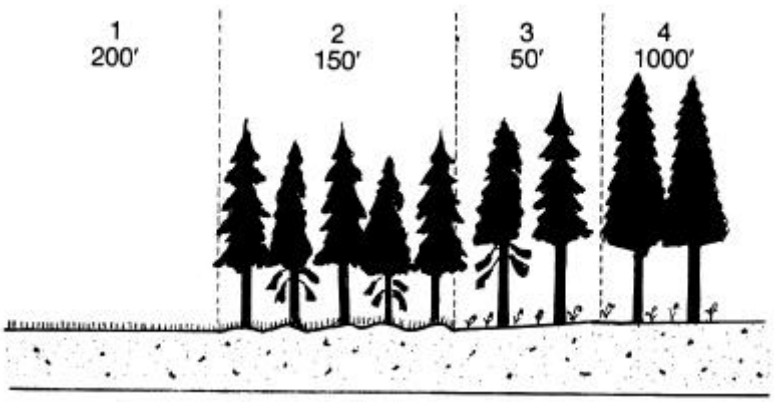
Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Engelmann spruce (*Picea engelmannii*)	70	43	20-70
Lodgepole pine (*Pinus contorta*)	60	43	30-70
TREE OVERSTORY-SUBDOMINANTS			
Lodgepole pine (*Pinus contorta*)	30	12	5-15
Engelmann spruce (*Picea engelmannii*)	20	10	5-15
TREE UNDERSTORY			
Engelmann spruce (*Picea engelmannii*)	90	5	2-15
Lodgepole pine (*Pinus contorta*)	60	4	1-10
SHRUBS			
Bog blueberry (*Vaccinium uliginosum*)	80	4	1-15
Douglas' spiraea (*Spiraea douglasii*)	60	3	1-5
SEDGES and RUSHES			
Widefruit sedge (*Carex angustata*)	100	32	5-70
Soft-leaved sedge (*Carex disperma*)	70	13	5-37
PERENNIAL GRASSES			
Tall mannagrass (*Glyceria striata*)	50	2	tr-5
PERENNIAL FORBS			
Broadpetal strawberry (*Fragaria virginiana*)	70	3	tr-5
Sidebells pyrola (*Orthilia secunda*)	70	3	tr-5
Queen's cup beadlily (*Clintonia uniflora*)	50	3	tr-10
Arrowleaf groundsel (*Senecio triangularis*)	50	2	tr-5
Lesser pyrola (*Pyrola minor*)	50	1	tr-5
Sweet-scented bedstraw (*Galium triflorum*)	50	1	tr-2
White bog-orchid (*Habenaria dilatata*)	50	tr	--
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	70	1	tr-5

Illustrations



1 **Few-flowered spikerush**, bog
2 **Bog blueberry/few-flowered spikerush**, bog
3 **Engelmann spruce/widefruit sedge**, forested wetland
4 Engelmann spruce/Queen's cup beadlily, transition slope

Upper Deschutes River Bog (near Little Lava Lake); low gradient, moderately high elevation basin; East Cascades Ecoregion



1 **Short-beaked sedge**, wet meadow
2 **Engelmann spruce/widefruit sedge**, forested wetland
3 **E**ngelmann spruce/Queen's cup beadlily, transitional
4 White fir/Queen's cup beadlily, terrace

Squaw Creek Marsh; flat, moderate elevation basin; East Cascades Ecoregion

Picea engelmannii/Cinna latifolia Association

Engelmann spruce/Drooping woodreed Association
1 plot. New type

Ecoregional Range
BM

Environment and Soils
This association occurs at moderately high elevations in the central and northern parts of the Blue Mountains Ecoregion. One plot was located n a gentle floodplain in the Elkhorn Mountains at5370 feet elevation. The site has 1% slope, and the valley is wide and low gradient with moderately steep sideslopes. The adjacent Rosgen stream reach was a B2 type. Depth to wet soil and redoximorphic features is 80 cm. Water table was at 110 cm at time of sampling.

Vegetation Composition
Engelmann spruce is the tree overstory dominant with a carpet of drooping woodreed comprising the herbaceous layer. Shrubs are scarce. One-leaf foamflower and heart-leaved miner's lettuce are well represented. 90% of the soil surface is covered by moss and 10% by litter. The height of the herbaceous layer is 197 cm. Herbaceous biomass is 1333 lbs/acre.

Dominant Species	Canopy Cover (%)
TREE OVERSTORY-DOMINANTS	
Engelmann spruce (*Picea engelmannii*)	25
TREE OVERSTORY-SUBDOMINANTS	
Engelmann spruce (*Picea engelmannii*)	2
TREE UNDERSTORY	
Engelmann spruce (*Picea engelmannii*)	tr
Subalpine fir (*Abies lasiocarpa*)	tr
SHRUBS	
Prickly currant (*Ribes lacustre*)	1
PERENNIAL GRASSES	
Drooping woodreed (*Cinna latifolia*)	95
Tall mannagrass (*Glyceria striata*)	2
PERENNIAL FORBS	
One-leaf foamflower (*Tiarella trifoliata* ssp. *unifoliata*)	20
Heart-leaved miner's lettuce (*Claytonia cordifolia*)	10
Alpine mitrewort (*Mitella pentandra*)	5
Arrowleaf groundsel (*Senecio triangularis*)	2
Nodding chickweed (*Cerastium nutans*)	2
Western polemonium (*Polemonium occidentale*)	1
Great North aster (*Canadanthus modestus*)	1
Western meadowrue (*Thalictrum occidentale*)	1
FERNS and HORSETAILS	
Ladyfern (*Athyrium filix-femina*)	1

Adjacent Vegetation
Upland vegetation adjacent to this site is mesic grand fir association.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1997: 47

Picea engelmannii/Bromus vulgaris Association

Engelmann spruce/Columbia brome Association
3 plots. New type

Ecoregional Range
BM

Environment and Soils
The Engelmann spruce/Columbia brome Association occurs at moderate elevations in the Blue Mountains Ecoregion in high gradient, narrow to moderately wide, V-shaped valleys with gentle to moderately steep sideslopes. Fluvial sites are floodplains with flat surfaces. Associated Rosgen stream types are B2, B3 and A4.

Valley Environment	Average	Range
Elevation (ft)	5340	4740-5820
Plot Slope (%)	7	6-10
Valley Width (m)	30	5-65
Valley Gradient (%)	7	--
Valley Sideslopes (%)	35	15-45
Local Climate		
Mean Annual Precipitation (in.)	29	21-37
Mean Annual Snowfall (in.)	116	69-146
Mean Annual Temperature (F)	42	41-43
Mean Minimum Temperature (F)	30	30-31
Mean Maximum Temperature (F)	54	52-56
Median Date of Last Spring Freeze	June 26	June 21-June 29
Median Date of First Fall Freeze	Sep. 4	Sep. 2-Sep. 5
Soil Characteristics		
Rooting Depth (cm)	30	20-51
Depth to Redoximorphic Features (cm)	21	14-25
Depth to Wet Soil (cm)	28	11-47
Current Water Table Depth (cm)	55	45-64
Depth to 30% Coarse Fragments (cm)	39	0-61
Depth to 80% Coarse Fragments (cm)	58	55-61
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	2	0-5
Gravel	-	-
Rock	tr	0-1
Moss	25	10-48
Liverwort	tr	0-tr
Lichen	tr	0-tr
Litter	72	51-90

Vegetation Composition
Engelmann spruce is the tree dominant with lodgepole pine and western larch present as seral overstory components. The understory is dominated by Columbia brome. Associated species include heartleaf arnica, sweet-scented bedstraw, sidebells pyrola, clasping twistedstalk, mountain sweet cicily and starry false-Solomon's seal. Commonly occurring shrubs are prickly currant, mountain alder, big huckleberry and thimbleberry. Average height of the shrub overstory is 1m, ranging from 0.6 to 1.5 m. Average height of the herbaceous layer is 50 cm, ranging from 23-76 cm. Herbaceous biomass averages 412 lbs/acre, ranging from 400-424 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Engelmann spruce (*Picea engelmannii*)	100	19	8-25
TREE OVERSTORY-SUBDOMINANTS			
Engelmann spruce (*Picea engelmannii*)	33	15	--
TREE UNDERSTORY			
Engelmann spruce (*Picea engelmannii*)	100	11	4-23
SHRUBS			
Prickly currant (*Ribes lacustre*)	100	33	13-60
Mountain alder (*Alnus incana*)	67	14	2-25
Big huckleberry (*Vaccinium membranaceum*)	67	7	6-8
Thimbleberry (*Rubus parviflorus*)	67	6	5-7
PERENNIAL GRASSES			
Columbia brome (*Bromus vulgaris*)	100	67	60-75
PERENNIAL FORBS			
Heartleaf arnica (*Arnica cordifolia*)	100	19	1-40
Sweet-scented bedstraw (*Galium triflorum*)	100	5	tr-12
Sidebells pyrola (*Orthilia secunda*)	100	2	tr-5
Clasping twistedstalk (*Streptopus amplexifolius*)	100	1	tr-2
Mountain sweet cicily (*Osmorhiza berteroi*)	67	7	3-11
Starry false Solomon's seal (*Maianthemum stellata*)	67	2	tr-3
Alpine mitrewort (*Mitella pentandra*)	67	2	1-2
Violets (*Viola* spp.)	67	2	1-2
Brook saxifrage (*Saxifraga odontoloma*)	67	2	1-2
Sharptooth angelica (*Angelica arguta*)	67	1	--
Fringed grass-of-Parnassus (*Parnassia fimbriata*)	67	1	--
Common cowparsnip (*Heracleum maximum*)	67	tr	tr-1
Heart-leaved miner's lettuce (*Claytonia cordifolia*)	67	tr	--

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are: lodgepole pine/grouse huckleberry, grand fir/big huckleberry, grand fir/grouse huckleberry and subalpine fir/twinflower.

Successional Dynamics

This association has a higher groundwater table than the Grand fir/Columbia brome Association described for the Blue Mountains in Johnson and Clausnitzer (1992), thus representing the riparian version of this similar association. It is possible that the high cover of Columbia brome is a result of high use of sites by elk and or cattle. With rest or decreased use by these grazing animals, sites may succeed to other Engelmann spruce associations such Engelmann spruce/Queen's cup beadlily, Engelmann spruce/Twinflower.

Other Studies Documenting Association with Plot Data

Oregon: Crowe and Clausnitzer 1987.

Picea engelmannii/Alnus incana-Cornus sericea ssp. sericea Association

Engelmann spruce/Mountain alder-Red-osier dogwood Association
5 plots. CEGL000892

Ecoregional Range
BM, EC

Environment and Soils
The Engelmann spruce/Mountain alder-red-osier dogwood Association is found at moderate elevations in the Blue Mountains and East Cascades Ecoregions in east-facing, narrow, low to high gradient, V- and trough-shaped valleys with gentle to moderately steep sideslopes. Geomorphic surfaces are floodplains. Soils are composed of coarse fragment-rich mineral materials. Water tables are within 0.5 m of the soil surface throughout the early growing season. Adjacent Rosgen stream reach types are A2, B3 and B4.

Valley Environment	Average	Range
Elevation (ft)	4658	3150-5550
Plot Slope (%)	3	1-6
Valley Width (m)	30	5-65
Valley Gradient (%)	4	1-7
Valley Sideslopes (%)	35	15-45
Local Climate		
Mean Annual Precipitation (in.)	33	26-48
Mean Annual Snowfall (in.)	131	81-186
Mean Annual Temperature (F)	42	41-46
Mean Minimum Temperature (F)	31	29-34
Mean Maximum Temperature (F)	54	52-57
Median Date of Last Spring Freeze	June 12	June 12-June 25
Median Date of First Fall Freeze	Sep. 7	Sep. 1-Sep. 14
Soil Characteristics		
Current Water Table Depth (cm)	60	43-77
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	12	0-60
Gravel	tr	0-1
Rock	2	0-5
Cryptogam	18	0-58
Liverwort	2	0-5
Litter	66	33-100

Vegetation Composition
The tree layer is dominated by Engelmann spruce in the overstory and understory. Lodgepole pine, subalpine fir, Douglas fir and grand fir occurred rarely. The scattered to dense shrub layer is composed of a red-osier dogwood-mountain alder overstory and prickly currant-stinking currant understory. Important species in the herbaceous layer include: sweet-scented bedstraw, starry false-Solomon's seal, clasping leaf twistedstalk, sharptooth angelica, pathfinder, drooping woodreed, and small-fruit bulrush. Height of the shrub overstory averages 3.2 m, ranging from 1.8-4.6 m. Height of the shrub understory averages 0.8 m, ranging from 0.6-0.9 m. Height of the herbaceous layer averages 20 cm, ranging from 5-36 cm. Herbaceous biomass averages 150 lbs/acre, ranging from 133-167 lbs/acre.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Engelmann spruce (*Picea engelmannii*)	100	32	8-60
TREE OVERSTORY-SUBDOMINANTS			
Engelmann spruce (*Picea engelmannii*)	60	4	3-5
White fir (*Abies concolor*)	40	6	5-7
Douglas fir (*Pseudotsuga menziesii*)	20	5	--
TREE UNDERSTORY			
Engelmann spruce (*Picea engelmannii*)	100	2	1-3
Grand fir (*Abies grandis*)	60	2	2-3
Subalpine fir (*Abies lasiocarpa*)	20	4	--
White fir (*Abies concolor*)	20	2	--
SHRUBS			
Red-osier dogwood (*Cornus sericea*)	100	34	4-60
Mountain alder (*Alnus incana*)	100	22	5-65
Prickly currant (*Ribes lacustre*)	80	13	1-30
Stinking swamp currant (*Ribes hudsonianum*)	80	5	1-8
PERENNIAL GRASSES			
Drooping woodreed (*Cinna latifolia*)	60	2	tr-5
Columbia brome (*Bromus vulgaris*)	60	1	1-2
PERENNIAL FORBS			
Sweet-scented bedstraw (*Galium triflorum*)	100	2	tr-5
Starry false Solomon's seal (*Maianthemum stellata*)	60	11	3-20
Claspleaf twistedstalk (*Streptopus amplexifolius*)	60	4	1-6
Queen's cup beadlily (*Clintonia uniflora*)	60	3	tr-5
Sharptooth angelica (*Angelica odontoloma*)	60	3	tr-6
Arrowleaf groundsel (*Senecio triangularis*)	60	2	tr-5
Baneberry (*Actaea rubra*)	60	2	tr-5
Rocky Mountain grass of Parnassus (*Parnassia fimbriata*)	60	tr	tr-1
Fireweed (*Chamerion angustifolium*)	60	tr	--
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	60	4	tr-10

Adjacent Vegetation

Adjacent upland vegetation types are: lodgepole pine-subalpine fir/grouse huckleberry, grand fir/big huckleberry and Douglas fir/pinegrass, fir-hemlock, and other grand fir and white fir associations.

Successional Dynamics

This association develops from the Mountain alder-red-osier dogwood Associations as sites transition from alluvial bars to floodplains and build up fine-textured soil surface layers over the coarse-textured bars. Severe fires that kill overstory conifers will allow the cover of the major shrubs to increase. Over time, Engelmann spruce will re-establish on sites and eventually form a tree overstory.

Other Studies Documenting Association with Plot Data

none

Picea engelmannii/Vaccinium uliginosum Association

Engelmann spruce/Bog blueberry Association
4 plots. CEGL000380

Ecoregional Range
EC

Environment and Soils
Engelmann spruce/Bog blueberry is found in the Cascade Mountains at moderate to moderately high elevations. Sites occur on the relatively dry, forested fringes of mountain meadow, stream, and lake landforms. Only four plots were sampled as most of the association occurs in inaccessible portions of the Cascade Mountains. Microtopography is flat and slopes gently towards adjacent meadows.

Valley Environment	Average	Range
Elevation (ft)	4690	3600-5900
Plot Slope (%)	0.5	0-1
Valley Gradient (%)	1	--
Local Climate		Range
Mean Annual Precipitation (in.)	44	34-58
Mean Annual Snowfall (in.)	193	160-225
Mean Annual Temperature (F)	42	42-43
Mean Minimum Temperature (F)	30	29-31
Mean Maximum Temperature (F)	54	53-56
Median Date of Last Spring Freeze	June 30	June 23-July 6
Median Date of First Fall Freeze	Aug. 31	Aug. 25-Sep. 9
Soil Characteristics		
Current Water Table Depth (cm)	35	30-40
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	-	-
Gravel or Rock	-	-
Cryptogam	25	0-70
Litter	75	30-100

The soils are derived from air-laid pumice, pumice alluvium, or pumice lacustrine deposits. Surface textures range from loamy coarse sand to sandy clay loam. Available water holding capacity ranges from moderate to high. Soil surfaces are rarely flooded. The high water table lies at least 15 cm below the soil surface and lowers to 90 or more cm below the soil surface in September.

Vegetation Composition
The Engelmann spruce/ bog blueberry Association is characterized by a dense canopy of conifers and a dense layer of low shrubs. Engelmann spruce dominates lodgepole pine as succession proceeds towards climax. Lodgepole pine dominates seral stands. Subalpine fir and mountain hemlock are scattered. The shrub layer is dominated by bog blueberry, dwarf huckleberry, and Douglas spiraea. Big huckleberry, sweetberry honeysuckle, and are often present in the shrub layer. Willows will not grow on these relatively dry sites. Graminoids are scattered in the ground layer. Scattered forbs include Queen's cup beadlily, Gray's licorice-root, lesser wintergreen, and longstalk clover. Without the dense shrub layer the association is similar to the Engelmann spruce/Queen's cup beadlily Association

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are: true fir -hemlock, and lodgepole pine associations.

Successional Dynamics
Wildfire is fairly frequent on these sites. The ground surface is dry by late summer so that fire would easily move into the stand from adjacent uplands. Both lodgepole pine and Engelmann spruce are sensitive to all but cool ground fires. Burned stands will tend to regenerate to lodgepole pine. Fire will not appreciably alter species composition in the undergrowth except for a temporary decrease in shrub cover.

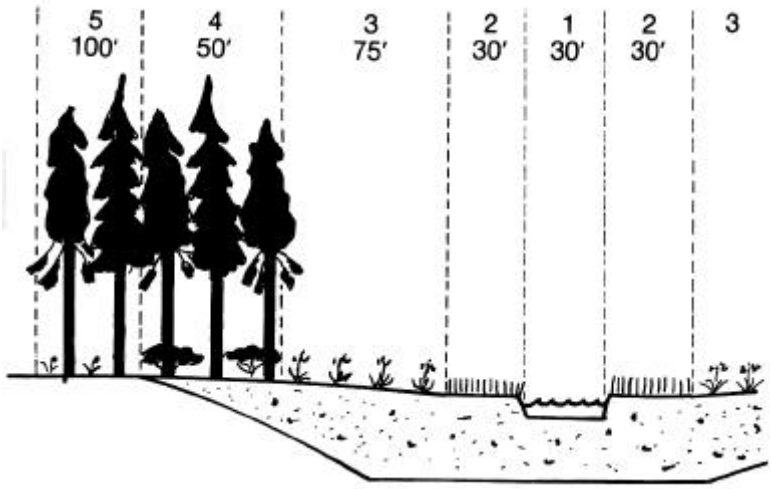
Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Lodgepole pine (*Pinus contorta*)	75	32	20-40
Engelmann spruce (*Picea engelmannii*)	50	34	30-37
Subalpine fir (*Abies lasiocarpa*)	25	10	--
TREE OVERSTORY-SUBDOMINANTS			
Engelmann spruce (*Picea engelmannii*)	50	5	--
Subalpine fir (*Abies lasiocarpa*)	50	3	1-5
TREE UNDERSTORY			
Engelmann spruce (*Picea engelmannii*)	100	3	1-5
Lodgepole pine (*Pinus contorta*)	75	10	5-15
Subalpine fir (*Abies lasiocarpa*)	75	3	2-5
SHRUBS			
Bog blueberry (*Vaccinium uliginosum*)	100	34	10-70
Dwarf huckleberry (*Vaccinium caespitosum*)	100	13	2-20
Douglas' spiraea (*Spiraea douglasii*)	100	9	5-15
Twinflower (*Linnaea borealis*)	75	13	2-35
Big huckleberry (*Vaccinium membranaceum*)	50	11	2-20
PERENNIAL FORBS			
Long-stalk clover (*Trifolium longipes*)	75	4	2-5
Queen's cup beadlily (*Clintonia uniflora*)	75	3	2-5
Gray's licoriceroot (*Ligusticum grayi*)	75	3	tr-5
Sidebells pyrola (*Orthilia secunda*)	75	2	tr-2
Canada dogwood (*Cornus canadensis*)	50	5	4-5
Broadpetal strawberry (*Fragaria virginiana*)	50	4	3-5
Starry false Solomon's seal (*Maianthemum stellata*)	50	4	2-5
Jeffrey's shooting star (*Dodecatheon jeffreyi*)	50	1	tr-2

Other Studies Documenting Association with Plot Data
Oregon: Kovalchik 1987: 51

Other Studies Documenting Association without Plot Data
Oregon: Titus and Christy 1996a, 1999

Illustrations

1 Pond
2 **Inflated sedge**, wet meadow
3 **Tufted hairgrass**, moist meadow
4 **Engelmann spruce/bog blueberry**, transition slope
5 Engelmann spruce/Queen's cup beadlily, transition slope



Heavenly Lakes Meadow; flat, moderate-high elevation basin; East Cascades Ecoregion

Picea engelmannii/Vaccinium uliginosum/Carex angustata Association

Engelmann spruce/Bog blueberry/Widefruit sedge Association
3 plots. CEGL000380.

Ecoregional Range
EC

Environment and Soils

The Engelmann spruce/Bog blueberry/Widefruit sedge Association is common only in the Cascade Mountains. East of the geographic distribution of Engelmann spruce it is replaced by the Lodgepole pine/Bog blueberry/Widefruit sedge Association. It occurs at moderate to moderately high elevations on the edges of bog, marsh, floodplain, or shallow drainage landforms. It is particularly abundant in cold, wet, headwaters basins such as Refrigerator Creek, Lake of the Woods, Sevenmile Marsh, and bogs near Little Cultus Lake. Microtopography is slightly undulating.

Surface soils are deep organic loam or sedge peat over a coarse pumice subsoil. Available water holding capacity is high. Sites are flooded from early to mid-summer and the water table is within 60 cm of the soil surface in September. Soils are usually saturated except on hummocks.

Valley Environment	Average	Range
Elevation (ft)	4883	4680-5020
Plot Slope (%)	0-7	0-1
Valley Gradient (%)	1	--
Local Climate		
Mean Annual Precipitation (in.)	48	36-60
Mean Annual Snowfall (in.)	204	168-270
Mean Annual Temperature (F)	42	41-42
Mean Minimum Temperature (F)	30	29-30
Mean Maximum Temperature (F)	53	51-56
Median Date of Last Spring Freeze	June 27	June 24-July 2
Median Date of First Fall Freeze	Sep. 4	Aug. 27-Sep. 11
Soil Characteristics		
Thickness of Surface Organic Layer (cm)	28	20-35
Current Water Table Depth (cm)	18	0-35
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	20	10-40
Gravel or Rock	-	-
Cryptogam	47	10-90
Litter	33	0-80

Vegetation Composition

Engelmann spruce dominates lodgepole pine as succession proceeds towards potential. Conifers are usually located on hummocks so that closed stands are rare. The shrub layer is dominated by bog blueberry and Douglas spiraea. Several species of willows occur in the stands and removal of the coniferous overstory may result in an increase in willow cover. Geyer, Lemmon, yellow, or Sitka willows are present at lower elevations while Booth, Eastwood, and undergreen willows occur at higher elevations. A dense sward of widefruit sedge dominates the ground layer. Soft-leaved sedge, Jones sedge, star sedge, few-flowered spikerush, beaked sedge, Sitka sedge, and bluejoint reedgrass are other common graminoids that in total are subordinant to widefruit. A rich component of wet site forbs includes shooting star, white bog-orchid, common horsetail, small bedstraw, western bistort, and pink wintergreen.

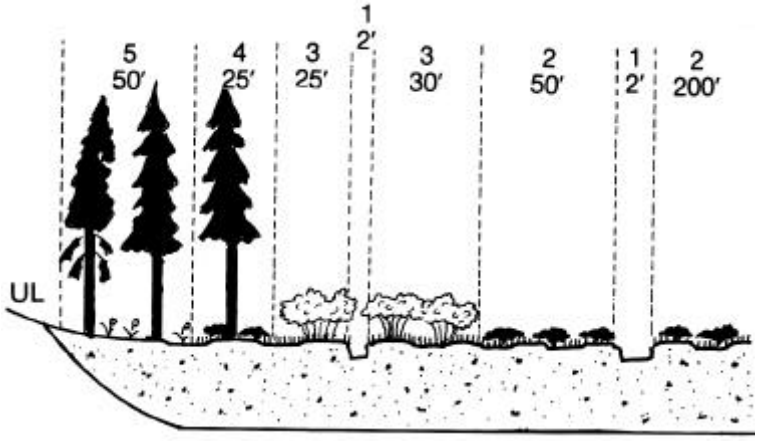
Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are: true fir -hemlock, subalpine fir and lodgepole pine associations.

Successional Dynamics
Wildfire is infrequent on the Engelmann spruce/Bog blueberry/Widefruit sedge Association. Engelmann spruce and lodgepole are sensitive to all but cool ground fire. Burned stands will tend to regenerate to lodgepole pine. Willows, Douglas spiraea, and bog blueberry will regenerate by sprouting from the stem base. Fire will not change the composition of the herbaceous component. Hot fires will consume dry peat soils, killing the reproductive tissue of most plant species.

Other Studies Documenting Association with Plot Data
Oregon: Kovalchik 1987: 53

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Engelmann spruce (*Picea engelmannii*)	33	60	--
Lodgepole pine (*Pinus contorta*)	33	25	--
TREE OVERSTORY-SUBDOMINANTS			
Engelmann spruce (*Picea engelmannii*)	67	8	5-10
Lodgepole pine (*Pinus contorta*)	67	12	--
TREE UNDERSTORY			
Engelmann spruce (*Picea engelmannii*)	100	10	5-12
Lodgepole pine (*Pinus contorta*)	67	2	--
SHRUBS			
Bog blueberry (*Vaccinium uliginosum*)	100	20	5-40
Douglas' spiraea (*Spiraea douglasii*)	67	6	5-7
Geyer's willow (*Salix geyeriana*)	67	2	--
Twinflower (*Linnaea borealis*)	67	2	--
Lemmon willow (*Salix lemmonii*)	33	15	--
MacKenzie's willow (*Salix prolixa*)	33	10	--
Bog birch (*Betula nana*)	33	7	--
Sitka willow (*Salix sitchensis*)	33	7	--
SEDGES and RUSHES			
Widefruit sedge (*Carex angustata*)	100	55	35-70
Jones' sedge (*Carex jonesii*)	67	10	tr-20
Soft-leaved sedge (*Carex disperma*)	67	5	2-7
Sitka sedge (*Carex aquatilis var. dives*)	67	4	2-5
PERENNIAL GRASSES			
Bluejoint reedgrass (*Calamagrostis canadensis*)	100	4	3-5
Tufted hairgrass (*Deschampsia caespitosa*)	67	2	tr-3
PERENNIAL FORBS			
Leafy aster (*Symphyotrichum foliaceum var. foliaceum*)	100	4	2-7
White bog-orchid (*Habenaria dilatata*)	100	2	tr-2
American bistort (*Polygonum bistortoides*)	67	3	--
Broadpetal strawberry (*Fragaria virginiana*)	67	2	--
Hairy willow-herb (*Epilobium ciliatum*)	67	2	--
Sidebells pyrola (*Orthilia secunda*)	67	1	tr-2
Pink wintergreen (*Pyrola asarifolia*)	67	1	tr-2
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	67	1	tr-2

Illustrations

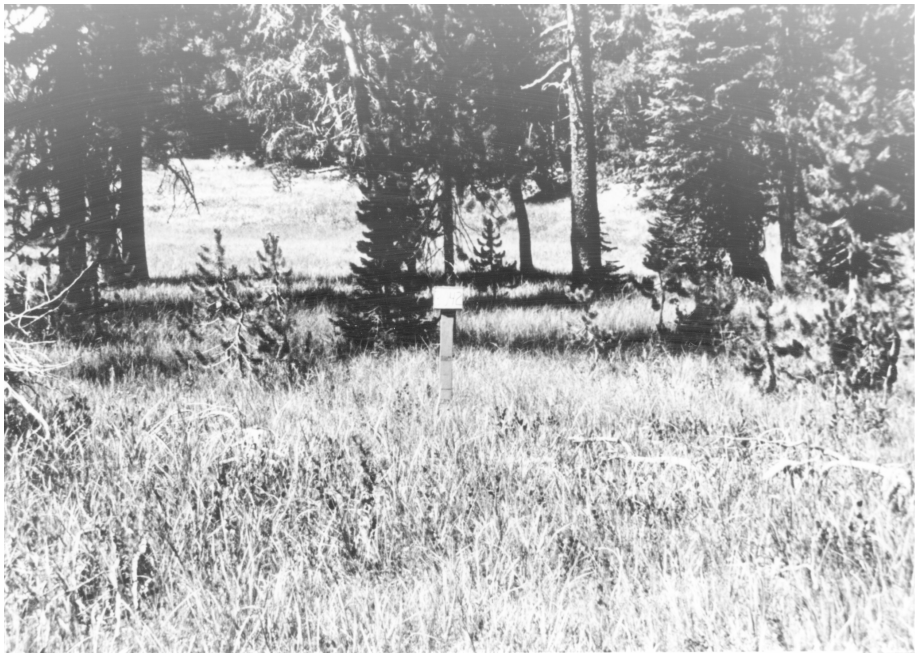


1 Unnamed first order streams
2 **Bog blueberry/few-flowered spikerush**, bog
3 **Geyer willow-Lemmon willow/Sitka sedge**, wet shrub meadow
4 **Engelmann spruce/bog blueberry/widefruit sedge**, forested wetland
5 Engelmann spruce/Queen's cup beadlily, transition slopes

Many Lakes Bog; flat, moderate-high elevation basin; East Cascades Ecoregion

Pinus contorta var. latifolia-Picea engelmannii/Eleocharis quinqueflora Association

Lodgepole pine-Engelmann spruce/Few-flowered spikerush Association
5 plots. CEGL000361.



Ecoregional Range
EC

Environment and Soils

The Lodgepole pine-Engelmann spruce/Few-flowered spikerush Association is common throughout the Cascade Mountains at elevations of moderately high elevation. It is rare eastward (though all of the sample sites used for this description are from east of the Cascades). Bogs develop in basin landforms within zones of abundant rainfall on flat, poorly-drained sites that support cold, water-saturated, soil development (Gorham 1957). Coastal-influenced wet climate and irregular, glaciated topography help create sites favorable for bog development in the Cascade Mountains. Eastward these requirements are met only at locations such as Pisgah Meadows (Ochoco National Forest), the headwaters of Jack Creek (Winema National Forest), and in the vicinity of Gearheart and Yamsay Mountains (Fremont National Forest).

Soils range from sedge to sphagnum and moss peats. Peat formation is due to slow plant decomposition on waterlogged sites (Gorham 1957). Low dissolved oxygen and water temperatures, lack of fluctuation in the water table and water temperature, plus concentration of organic and mineral acids (tannins, etc.) in the water table all contribute to slow decomposition of plant residues and peat accumulates. The soil surface is saturated through most of the summer. Available water holding capacity is very high.

Valley Environment	Average	Range
Elevation (ft)	5948	5320-6200
Plot Slope (%)	4	0-7
Valley Gradient (%)	5	3-7
Local Climate		
Mean Annual Precipitation (in.)	34	29-43
Mean Annual Snowfall (in.)	147	97-188
Mean Annual Temperature (F)	41	40-42
Mean Minimum Temperature (F)	30	29-31
Mean Maximum Temperature (F)	53	51-55
Median Date of Last Spring Freeze	July 4	June 22-July 13
Median Date of First Fall Freeze	Sep. 1	Aug. 20-Sep. 12
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	22	5-65
Gravel	-	-
Rock	-	-
Cryptogam	51	15-85
Litter	27	0-80

Vegetation Composition

Vegetative composition is variable on these undulating sites. Trees, shrubs, grasses, and taller sedges dominate hummocks, while few-flowered spikerush, mud sedge, great sundew (*Drosera anglica*), and aquatic plants such as buckbean (*Menyanthes trifoliata*) or bladderwort (*Utricularia* spp.) dominate the water paths. Estimated herbage production ranged from 350 to 1000 (970) lbs/acre dry weight.

Potential natural vegetation: Lodgepole pine and Engelmann spruce are co-dominant in the Cascade mountains. Eastward, Engelmann spruce is usually absent. Dwarfed shrubs, especially bog birch, bog blueberry, Booth willow , undergreen willow (*Salix commutata*), Eastwood willow, alpine laurel, and sweetberry honeysuckle, are common and may dominate the ground cover. Few-flowered spikerush and moss are conspicuous in the herb layer. Tufted hairgrass and slender muhly are present on many plots. Other grasses are inconspicuous. Normally robust sedges such as aquatic, widefruit, Sitka, bladder, or Holm's sedges are dwarfed, scattered, and lack vigor but can have fair canopy cover (7-15%). Which sedge is present depends on the geographic and elevational position of the stand. Jones, mud, and star sedges are characteristic bog graminoids. The rich variety of forbs includes leafy aster, strawberry, white bog-orchid, elephant's head, bog saxifrage, longstalk clover, shooting stars, tofieldia , common horsetail, primrose monkeyflower, and American bistort.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Lodgepole pine (*Pinus contorta*)	80	31	20-37
TREE OVERSTORY-SUBDOMINANTS			
Lodgepole pine (*Pinus contorta*)	20	10	--
*Engelmann spruce (*Picea engelmannii*)	20	5	--
TREE UNDERSTORY			
Lodgepole pine (*Pinus contorta*)	100	7	3-15
*Engelmann spruce (*Picea engelmannii*)	20	5	--
SHRUBS			
Bog birch (*Betula nana*)	100	10	5-15
Dwarf huckleberry (*Vaccinium caespitosum*)	100	4	2-7
Geyer willow (*Salix geyeriana*)	80	4	1-5
Eastwood willow (*Salix eastwoodiae*)	60	12	5-15
Booth willow (*Salix boothii*)	50	1	--
*Bog blueberry (*Vaccinium uliginosum*)	40	13	5-20
Sweetberry honeysuckle (*Lonicera caerulea*)	40	5	--
SEDGES and RUSHES			
Few-flowered spikerush (*Eleocharis quinqueflora*)	100	19	5-45
Aquatic sedge (*Carex aquatilis* var. *aquatilis*)	80	11	7-15
Jones' sedge (*Carex jonesii*)	80	10	3-15
Field woodrush (*Luzula campestris*)	80	2	tr-5
Holm's sedge (*Carex scopulorum*)	40	6	5-7
Star sedge (*Carex echinata*)	40	5	2-7
Widefruit sedge (*Carex angustata*)	20	15	--
Bladder sedge (*Carex utriculata*)	20	2	--
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	80	5	2-10
Slender muhly (*Muhlenbergia filiformis*)	60	7	2-15
PERENNIAL FORBS			
Longstalk clover (*Trifolium longipes*)	100	6	tr-15
Bog saxifrage (*Saxifraga oregana*)	80	7	3-15
Elephant's head (*Pedicularis groenlandica*)	80	5	tr-15
Broadpetal strawberry (*Fragaria virginiana*)	80	4	2-5
Leafy aster (*Symphyotrichum foliaceum* var. *foliaceum*)	80	4	2-5
White bog-orchid (*Habenaria dilatata*)	80	2	tr-5
American bistort (*Polygonum bistortoides*)	50	3	--
Shooting stars (*Dodecatheon* spp.)	50	2	--
Primrose monkeyflower (*Mimulus primuloides*)	50	2	--
FERNS and HORSETAILS			
Common horsetail (*Equisetum arvense*)	60	2	tr-3

* = None of the sample plots were located in the Cascades. Therefore, data for Engelmann spruce and bog blueberry are not representative of Cascadian sites where these two species are co-dominants.

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled subalpine fir and lodgepole pine associations.

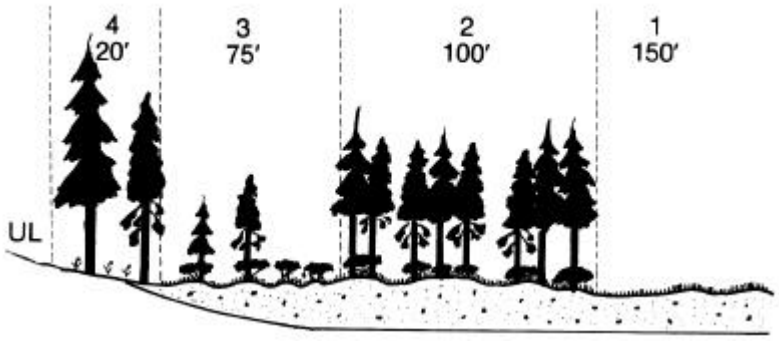
Successional Dynamics

Wildfire is infrequent in bogs (100-300 year frequency). Species composition will remain relatively the same following cool fires except for a reduction in conifers. The shrubs will resprout from stem bases while the various graminoids and forbs will regenerate from roots, rhizomes, and corms. Peat soils are flammable when dry and deeply burning fires will restrict the regeneration of most plants by destroying their roots. Long periods of drought may dry the soil surface, starting a trend where decomposition exceeds buildup or where fire lowers the soil surface. However, in the long run these bog sites are self perpetuating. The eventual long-term potential is a larger, deeper bog and not forest.

Other Studies Documenting Association with Plot Data

Oregon: Kovalchik 1987

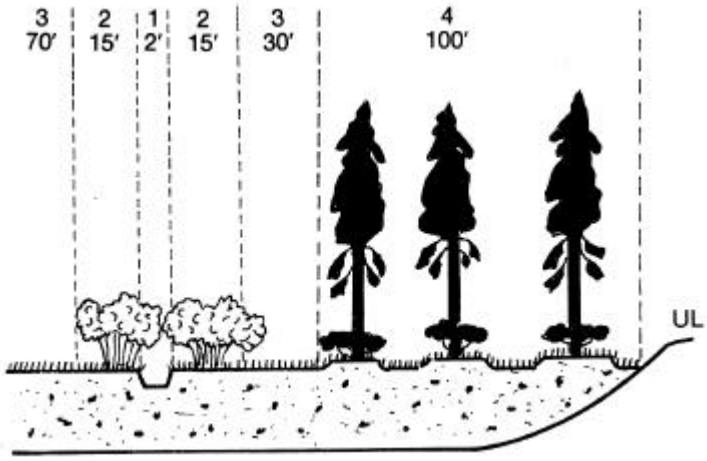
Illustrations



1 **Few-flowered spikerush**, bog
2 **Lodgepole pine-Engelmann spruce/few-flowered spikerush**, bog
3 **Bog blueberry/few-flowered spikerush**, bog
4 Engelmann spruce/Queen's cup beadlily, transition slope

Cascade Lakes Highway Bog (near Wire Meadow); low gradient, mod-high elevation basin

1 Jack Creek, first order
2 **Booth willow-Geyer willow/ widefruit sedge**, wet shrub meadow
3 **Few-flowered spikerush**, bog
4 **Lodgepole pine-Engelmann spruce/ few-flowered spikerush**, bog



Headwaters Jack Creek; flat, moderate elevation basin; East Cascades Ecoregion

Pinus contorta var. latifolia/Vaccinium uliginosum Association

Lodgepole pine/Bog blueberry Association
7 plots. CEGL000171

Ecoregional Range
EC, WC

Environment and Soils
The Lodgepole pine/Bog blueberry Association occurs over a wide range of elevations on the relatively dry, forested margins of meadow, lake, and forest basin landforms. Microtopography is flat and slopes gently towards adjacent meadows and forested wetlands. Sites are intermediate in soil moisture characteristics between the Lodgepole pine/Bog blueberry/Widefruit sedge Association and Lodgepole pine/Bearberry-mountain gooseberry or Engelmann spruce/Queen's cup beadlily Associations. Soils are derived from air-laid pumice, pumice alluvium, or pumice lacustrine deposits. Surface textures range from loamy coarse sand to fine sandy loam. Organic matter content is low. Available water holding capacity is moderate. The soil surface is rarely flooded. The maximum water table lies about 15 cm below the soil surface in June and lowers to about 60 cm below the surface in August and September.

Valley Environment	Average	Range
Elevation (ft)	5233	4350-5900
Plot Slope (%)	2	0-5
Valley Gradient (%)	3	1-5
Local Climate		
Mean Annual Precipitation (in.)	49	21-81
Mean Annual Snowfall (in.)	205	71-352
Mean Annual Temperature (F)	42	40-43
Mean Minimum Temperature (F)	30	27-32
Mean Maximum Temperature (F)	55	51-59
Median Date of Last Spring Freeze	June 29	June 22-July 10
Median Date of First Fall Freeze	Aug. 31	Aug. 20-Sep. 9
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	2	0-5
Gravel	-	-
Rock	tr	0-5
Cryptogam	21	5-70
Litter	77	30-95

Vegetation Composition
Lodgepole pine/Bog blueberry has a moderately dense canopy of lodgepole pine over a dense layer of low shrubs. Lodgepole pine is climax and the dominant tree. Mountain hemlock, western white pine, subalpine fir, and white fir occur as scattered individuals. The shrub layer is dominated by bog blueberry, Douglas spiraea, and dwarf huckleberry. Big huckleberry and grouse huckleberry are present in higher elevation stands. Bluejoint reedgrass and timber oatgrass are often common. There is a modest compliment of forbs, none of which have very high cover or constancy.

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are: white fir, mountain hemlock, lodgepole pine and true fir-hemlock associations.

Successional Dynamics

With overuse by livestock, bog blueberry and other shrubs decrease in cover with trampling and soil compaction. Disturbances are more likely to result in an increase in the cover of bare ground rather than an increase in herbs. Wildfire was probably fairly frequent in this association. The ground surface is dry by August so that fire can easily move onto the site from adjacent upland. Lodgepole pine is sensitive to all but cool ground fires but regenerates rapidly on burned sites. The shrubs, graminoids, and forbs are well adapted to regenerating themselves after fire so there should be little change in species composition except for a temporary decrease in cover of shrubs and lodgepole pine.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Lodgepole pine (*Pinus contorta*)	86	40	20-70
TREE OVERSTORY-SUBDOMINANTS			
Mountain hemlock (*Tsuga mertensiana*)	29	5	--
Western white pine (*Pinus monticola*)	29	5	--
Lodgepole pine (*Pinus contorta*)	14	10	--
TREE UNDERSTORY			
Lodgepole pine (*Pinus contorta*)	86	4	2-10
White fir (*Abies concolor*)	43	1	--
Subalpine fir (*Abies lasiocarpa*)	29	2	--
Mountain hemlock (*Tsuga mertensiana*)	29	2	--
Western white pine (*Pinus monticola*)	29	2	1-2
SHRUBS			
Bog blueberry (*Vaccinium uliginosum*)	100	28	10-70
Dwarf huckleberry (*Vaccinium caespitosum*)	100	17	5-37
Douglas' spiraea (*Spiraea douglasii*)	86	22	5-37
Grouse huckleberry (*Vaccinium scoparium*)	58	9	5-15
Sweetberry honeysuckle (*Lonicera caerulea*)	58	4	1-5
PERENNIAL GRASSES			
Bluejoint reedgrass (*Calamagrostis canadensis*)	71	11	5-37
Timber oatgrass (*Danthonia intermedia*)	57	9	tr-15
Tufted hairgrass (*Deschampsia caespitosa*)	57	2	tr-5
PERENNIAL FORBS			
Long-stalk clover (*Trifolium longipes*)	57	9	5-15
Gray's licoriceroot (*Ligusticum grayi*)	43	4	tr-5
Fireweed (*Chamerion angustifolium*)	43	2	tr-5
Littleleaf pussytoes (*Antennaria microphylla*)	29	10	5-15
Northern bedstraw (*Galium boreale*)	29	8	tr-15
Streambank butterweed (*Senecio pseudaureus*)	29	3	tr-5
Broadpetal strawberry (*Fragaria virginiana*)	29	3	tr-5
Woods strawberry (*Fragaria vesca*)	29	3	tr-5

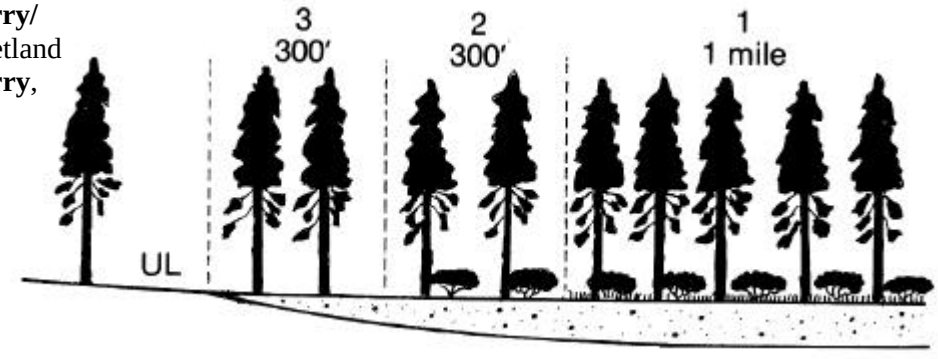
Other Studies

Documenting Association with Plot Data

Oregon: Volland 1976: 33, Seyer 1979: 117, Kovalchik 1987: 39, Titus and Christy 1996a, 1999

Illustrations

1 **Lodgepole pine/bog blueberry/ widefruit sedge**, forested wetland
2 **Lodgepole pine/bog blueberry**, transitional
3 **Lodgepole pine/bearberry**, transitional



Jackie's Thicket; flat, moderate elevation basin; East Cascades Ecoregion

Pinus contorta var. latifolia/Vaccinium uliginosum/Carex angustata Association

Lodgepole pine/Bog blueberry/Widefruit sedge Association
8 plots. CEGL000171

Ecoregional Range
EC, WC

Environment and Soils

The Lodgepole pine/Bog blueberry/Widefruit sedge Association occurs in the East and West Cascades Ecoregion at moderate elevations. It is not very common because bog blueberry does not extend far below the elevational range of Engelmann spruce except on exceptionally cold sites. It is found on flat, wet, cold floodplain and basin landforms such as the forested margins of Lake of the Woods, the floodplains of Fall River and Crescent Creeks, Jackie's Thicket, and Strawberry Spring. The microtopogtaphy is slightly undulating, flat, or slightly concave. This association is also illustrated in figures for the Geyer willow-Lemmon willow/Widefruit sedge and Slender sedge associations. Lodgepole pine/Bog blueberry/Widefruit sedge is closely associated with the deep pumice mantles just east of the Cascades. Soils are deep pumice alluviums. Surface horizons are high in organic matter because of long periods of water saturation. However, except for one plot, they do not have enough organic material to be called organic loam. Available water holding capacity is moderate. Subsurface soils are permanently saturated coarse pumice. The soil surface is flooded through July and the water table is 25 to 60 cm below the soil surface in September.

Valley Environment	Average	Range
Elevation (ft)	4794	4200-5100
Plot Slope (%)	0.6	0-1
Valley Gradient (%)	1	--
Local Climate		
Mean Annual Precipitation (in.)	31	20-48
Mean Annual Snowfall (in.)	128	80-174
Mean Annual Temperature (F)	43	42-43
Mean Minimum Temperature (F)	30	29-31
Mean Maximum Temperature (F)	56	53-56
Median Date of Last Spring Freeze	July 5	June 24-July 10
Median Date of First Fall Freeze	Aug. 26	Aug. 21-Sep. 11
Soil Characteristics		
Current Water Table Depth (cm)	49	5-105
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	2	0-15
Gravel and Rock	-	-
Cryptogam	13	5-37
Litter	85	63-95

Vegetation Composition

Lodgepole pine is climax and the dominant tree. Other conifers are scattered. Bog blueberry and Douglas spiraea are the dominant shrubs. A variety of willows, especially Geyer willow, occur in the stands and may increase dramatically in cover with even partial removal of the overstory. The ground cover is characterized by a sward of widefruit sedge. Other grasses and sedges are low in cover. Bluejoint reedgrass is the most consistent grass. Forbs are inconspicuous and include scarlet paintbrush, common horsetail, broadpetal strawberry, Oregon checkermallow (*Sidalcea oregana*), common monkeyflower (*Mimulus guttatus*), and bog St. John's wort (*Hypericum anagalloides*).

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are: lodgepole pine associations and mixed lodgepole pine-Ponderosa pine stands.

Successional Dynamics

With overuse by livestock, bog blueberry decreases in cover with trampling and soil compaction. Grasses such as Kentucky bluegrass (*Poa pratensis*) and forbs increase in cover in response to the declining vigor of widefruit sedge. Widefruit sedge responds quickly to rest and late season grazing in stands in mid seral or better ecological status. Continued overuse may lead to increased streambank erosion and the inability to control streamflow during peak runoffs. Streambed downcutting may occur and result in lowered water tables. Under these hydrologic conditions the site potential may change to the Lodgepole pine/Bog blueberry Association or Lodgepole pine/Kentucky bluegrass community type.

Lodgepole pine is sensitive to all but cool ground fire. Willows, Douglas spiraea, and bog blueberry will resprout from stem bases. Fire will not change the composition of the herb layer.

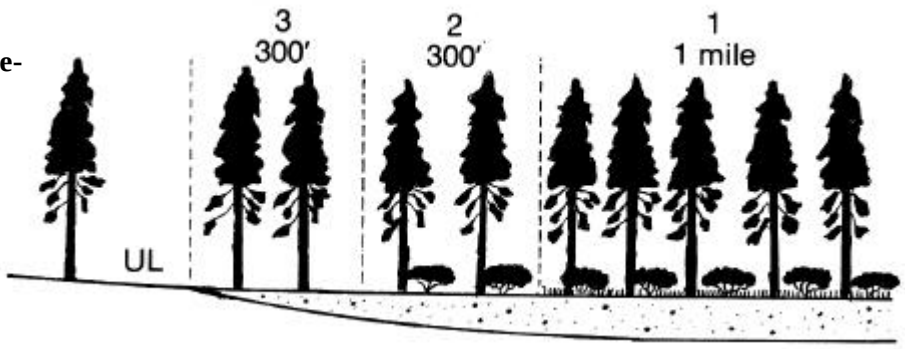
Other Studies Documenting Association with Plot Data

Oregon: Volland's (1976) Lodgepole pine/blueberry/forb wetland contains this association, Kovalchik 1987: 39

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Lodgepole pine (*Pinus contorta*)	75	40	35-45
TREE OVERSTORY-SUBDOMINANTS			
Lodgepole pine (*Pinus contorta*)	25	15	--
TREE UNDERSTORY			
Lodgepole pine (*Pinus contorta*)	100	10	2-40
SHRUBS			
Bog blueberry (*Vaccinium uliginosum*)	100	29	15-55
Douglas' spiraea (*Spiraea douglasii*)	88	18	10-35
Geyer's willow (*Salix geyeriana*)	88	10	1-20
Dwarf huckleberry (*Vaccinium caespitosum*)	75	7	3-15
Sweetberry honeysuckle (*Lonicera caerulea*)	50	9	5-15
SEDGES and RUSHES			
Widefruit sedge (*Carex angustata*)	100	21	5-60
PERENNIAL GRASSES			
Bluejoint reedgrass (*Calamagrostis canadensis*)	63	3	tr-6
Tufted hairgrass (*Deschampsia caespitosa*)	50	3	tr-5
PERENNIAL FORBS			
Broadpetal strawberry (*Fragaria virginiana*)	100	2	tr-5
Fireweed (*Chamerion angustifolium*)	75	tr	tr-3
Streambank butterweed (*Senecio pseudaureus*)	50	3	2-5
Scarlet paintbrush (*Castilleja miniata*)	50	tr	tr-2
Smooth-stemmed aster (*Symphiotrichum laeve* var. *geyeri*)	50	tr	tr-2

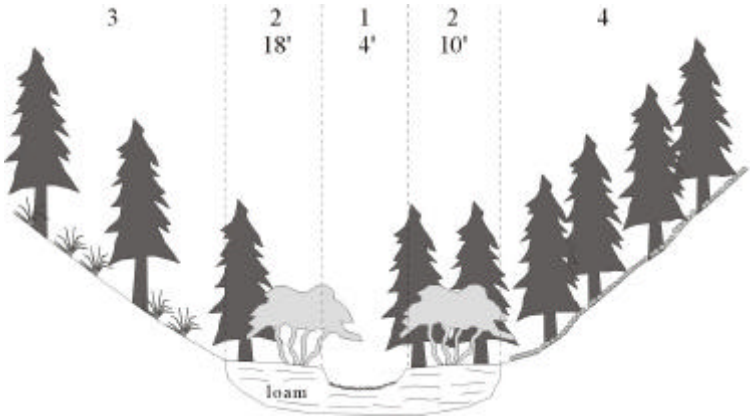
Illustrations

1 **Lodgepole pine/bog blueberry/wide-fruit sedge**, forested wetland
2 **Lodgepole pine/bog blueberry**, transitional
3 **Lodgepole pine/bearberry**, transitional



Jackie's Thicket; flat, moderate elevation basin; East Cascades Ecoregion

1 Lake of the Woods
2 **Inflated sedge**, permanently flooded shore
3 **Nevada rush**, semi-permanently flooded shore
4 **Slender sedge**, semi-perm. flooded shore
5 **Tufted hairgrass**, moist meadow
6 **Lodgepole pine/bog blueberry/widefruit sedge**, forested wetland
7 Engelmann spruce/Queen's cup beadlily, terrace



Lake of the Woods; flat, moderate elevation lake basin; East Cascades Ecoregion

Pinus contorta var. latifolia/Spiraea douglasii Association

Lodgepole pine/Douglas spiraea Association
9 plots. CEGL002604.

Ecoregional Range
EC

Environment and Soils
The Lodgepole pine/Douglas spiraea Association is common at moderate elevations (4100-5300 feet) in the western part of the East Cascades Ecoregion and is common on the eastern fringe of the East Cascades Ecoregion at higher elevation (4800-5800 feet). This transitional association is common on several landforms, including: 1) low gradient, shallowly incised, pumice-filled drainages and basins, 2) narrow, deeply incised, moderate gradient drainages with narrow floodplains, and 3) moderate gradient, narrow floodplains in deep valleys in the vicinity of the Cascade Mountains and Yamsay Mountain in the Cascades. See the descriptions for Lodgepole pine/Widefruit sedge and Lodgepole pine/Douglas spiraea/Widefruit sedge Associations for other figures showing this association. Soils are derived from deep pumice alluvium or air-laid pumice. Surface textures ranged from loamy sand to fine sandy loam. Available water holding capacity is moderately low. There is insignificant accumulation of organic matter in the soil surface. Subsurface soils are of very coarse pumice. The association is intermediate in soil moisture between the Lodgepole pine/Douglas spiraea/Widefruit sedge and Lodgepole pine/Bearberry Associations. Maximum water tables are 15-60 cm below the soil surface in May and June. The water table lowers to 90-120 cm below the soil surface in August and September.

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are: white fir and lodgepole pine associations and lodgepole pine-Ponderosa pine stands.

Valley Environment	Average	Range
Elevation (ft)	4472	4300-5550
Plot Slope (%)	3	1-10
Valley Gradient (%)	3	1-10
Local Climate		
Mean Annual Precipitation (in.)	26	21-33
Mean Annual Snowfall (in.)	94	71-159
Mean Annual Temperature (F)	43	42-44
Mean Minimum Temperature (F)	29	27-32
Mean Maximum Temperature (F)	57	55-59
Median Date of Last Spring Freeze	July 4	June 25-July 14
Median Date of First Fall Freeze	Aug. 26	Aug. 17-Sep. 7
Soil Characteristics		
Current Water Table Depth (cm)	80	40-175
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	12	0-70
Gravel	tr	0-5
Rock	1	0-5
Cryptogam	2	0-15
Litter	84	30-100

Vegetation Composition

The association is characterized by an overstory of lodgepole pine and a dense shrub layer dominated by Douglas spiraea. Lodgepole pine is climax and other conifers are scattered. Bearberry is common on most plots. On two plots, mountain gooseberry is the most abundant shrub. Willows and sedges are absent or restricted to moist microsites. Grasses are poorly represented, blue wildrye is the only consistent grass found on the sample plots. The relatively dry forb layer includes western yarrow, broadpetal strawberry, northern bedstraw, starry false Solomon's plume, and long-stalk clover.

Successional Dynamics

With overuse by livestock, Douglas spiraea decreases in cover because of trampling. Disturbances are more likely to result in an increase in the cover of bare ground rather than a dramatic increase in grasses and forbs. Wildfire was probably common in this type. Soils are dry by mid-summer and fire can easily encroach from adjacent uplands. Douglas spiraea will resprout from the stem base. Fire will not change the vegetative composition of the association except for its impacts on lodgepole pine.

Other Studies with Plot Data

Oregon: Kovalchik 1987: 33

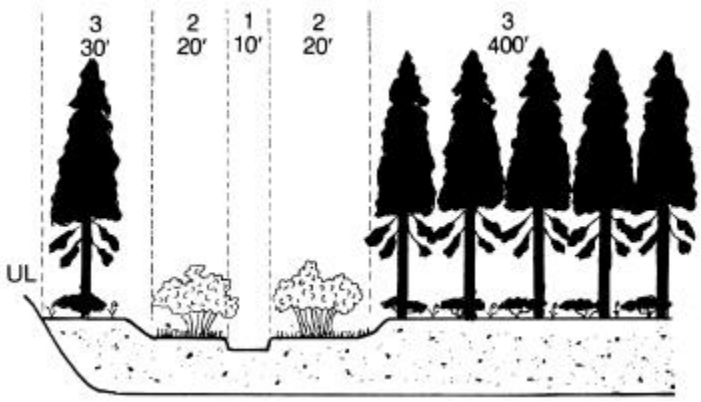
Other Studies without Plot Data

Oregon: Titus and Christy 1996a, 1999

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Lodgepole pine (*Pinus contorta*)	100	53	37-70
TREE UNDERSTORY			
Lodgepole pine (*Pinus contorta*)	100	8	1-15
SHRUBS			
Douglas' spiraea (*Spiraea douglasii*)	100	38	15-65
Bearberry (*Arctostaphylos uva-ursi*)	67	11	5-15
Wood's rose (*Rosa woodsii*)	67	67	1-15
Dwarf huckleberry (*Vaccinium caespitosum*)	56	8	2-15
Prickly currant (*Ribes lacustre*)	56	2	1-5
PERENNIAL GRASSES			
Blue wildrye (*Elymus glaucus*)	67	4	tr-7
PERENNIAL FORBS			
Broadpetal strawberry (*Fragaria virginiana*)	89	6	2-15
Yarrow (*Achillea millefolium*)	89	4	tr-5
Fireweed (*Chamerion angustifolium*)	89	2	tr-5
Northern bedstraw (*Galium boreale*)	67	5	2-5
Starry false Solomon's seal (*Maianthemum stellata*)	67	2	tr-5
Long-stalk clover (*Trifolium longipes*)	56	12	tr-37
Bigleaf lupine (*Lupinus polyphyllus*)	44	11	5-15
Red columbine (*Aquilegia formosa*)	44	2	tr-5
Elk thistle (*Cirsium foliosum*)	44	tr	--

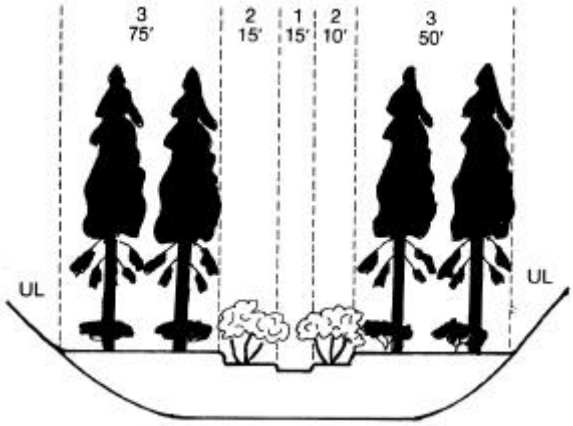
Illustrations

1 Coyote Creek, second-order
2 **Willow/widefruit sedge**, active channel shelves
3 **Lodgepole pine/Douglas spiraea**, inactive floodplains or terraces



Coyote Creek; low gradient, moderate-low elevation floodplain; East Cascades Ecoregion

1 Miller Creek, third order
2 **Mountain alder-Douglas spiraea**, active channel shelves and streambanks
3 **Lodgepole pine/Douglas spiraea**, inactive floodplains



Miller Creek; mod gradient, mod elevation floodplain; East Cascades Ecoregion

Pinus contorta var. latifolia/Spiraea douglasii/Carex angustata Association

Lodgepole pine/Douglas spiraea/Widefruit sedge Association
10 plots. CEGL002604

Ecoregional Range
EC

Environment and Soils

The Lodgepole pine/Douglas spiraea/Widefruit sedge Association is common at low to moderate elevations (4100-5100 feet) on the flanks of the Cascades and also occurs sporadically on the west fringe of the Fremont National Forest. It is strongly associated with deep pumice mantles. Sites are on low gradient, pumice-filled basins and drainages. These sites are east of the distribution of Engelmann spruce and bog blueberry. Microtopography is flat, slightly undulating, to slightly concave. The sites are intermediate in soil moisture characteristics between the Lodgepole pine/Douglas spiraea and Lodgepole pine/Widefruit sedge Associations. Sample plots were located at Sand, Spring, and Tumalo Creeks, Deschutes and Little Deschutes Rivers, and various small, unnamed drainages and basins. See the description for the Sitka sedge Association for another figure illustrating this association. Soils are derived from deep pumice alluvium. Surface textures ranged from loamy sands to silty clay loam. Surface horizons do not have enough organic matter to be classified as organic soils. Two sample plots have an organic loam surface horizon. Available water holding capacity is moderate. The water table is near to slightly above the soil surface in June and lowers to 60-90 cm below the surface in August.

Valley Environment	Average	Range
Elevation (ft)	4449	3600-5050
Plot Slope (%)	3	0-20
Valley Gradient (%)	6	1-20
Local Climate		
Mean Annual Precipitation (in.)	25	9-51
Mean Annual Snowfall (in.)	110	28-284
Mean Annual Temperature (F)	44	42-46
Mean Minimum Temperature (F)	30	27-33
Mean Maximum Temperature (F)	57	54-60
Median Date of Last Spring Freeze	July 2	June 27-July 9
Median Date of First Fall Freeze	Aug. 27	Aug. 19-Sep. 6
Soil Characteristics		
Current Water Table Depth (cm)	51	3-70
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	2	0-10
Gravel	-	-
Rock	-	-
Cryptogam	4	0-15
Litter	95	80-100

Vegetation Composition

Lodgepole pine is climax and the dominant tree. Other conifers are scattered. Quaking aspen was common in several plots where lodgepole pine is gaining dominance over quaking aspen in late succession on the Quaking aspen/Douglas spiraea/Widefruit sedge Association. The undergrowth is dominated by low shrubs, especially Douglas spiraea. Willows are more abundant here than on other forest wetland associations. Woods rose is present in many stands. Widefruit sedge is common in the undergrowth except for one plot that was dominated by woolly sedge. Fowl bluegrass (*Poa palustris*) is common on some of the wetter sites. Blue wildrye and

Kentucky bluegrass are the most common grasses. Forbs include broadpetal strawberry, starry false-Solomon's seal, American vetch, large-leaved avens, western St. John's wort, steambank butterweed, and western polemonium.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Lodgepole pine (*Pinus contorta*)	90	52	37-70
Quaking aspen (*Populus tremuloides*)	20	28	25-30
TREE OVERSTORY-SUBDOMINANTS			
Lodgepole pine (*Pinus contorta*)	10	15	--
Quaking aspen (*Populus tremuloides*)	10	10	--
TREE UNDERSTORY			
Lodgepole pine (*Pinus contorta*)	100	5	1-15
Quaking aspen (*Populus tremuloides*)	30	13	7-17
SHRUBS			
Douglas' spiraea (*Spiraea douglasii*)	100	31	10-70
Wood's rose (*Rosa woodsii*)	60	9	3-15
Geyer's willow (*Salix geyeriana*)	60	7	1-15
Lemmon willow (*Salix lemmonii*)	50	12	2-37
Booth willow (*Salix boothii*)	50	10	5-15
SEDGES and RUSHES			
Widefruit sedge (*Carex angustata*)	100	14	5-35
Baltic rush (*Juncus balticus*)	50	1	tr-5
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	70	6	2-15
Blue wildrye (*Elymus glaucus*)	60	7	tr-15
PERENNIAL FORBS			
Broadpetal strawberry (*Fragaria virginiana*)	90	5	tr-15
Starry false Solomon's seal (*Maianthemum stellata*)	60	5	tr-15
American vetch (*Vicia americana*)	50	3	tr-5
Western polemonium (*Polemonium occidentale*)	50	2	tr-5
Dandelion (*Taraxacum officinale*)	50	2	tr-3
Western St. John's wort (*Hypericum scouleri*)	40	3	tr-5
Streambank butterweed (*Senecio pseudaureus*)	40	3	tr-5
Western aster (*Aster spathulatum)*	40	3	tr-5
Large-leaf avens (*Geum macrophyllum*)	40	2	tr-5
Meadow arnica (*Arnica chamissonis*)	40	2	tr-5
Small cleavers (*Galium trifidum*)	40	2	tr-5
Fireweed (*Chamerion angustifolium*)	40	tr	--

Adjacent Vegetation

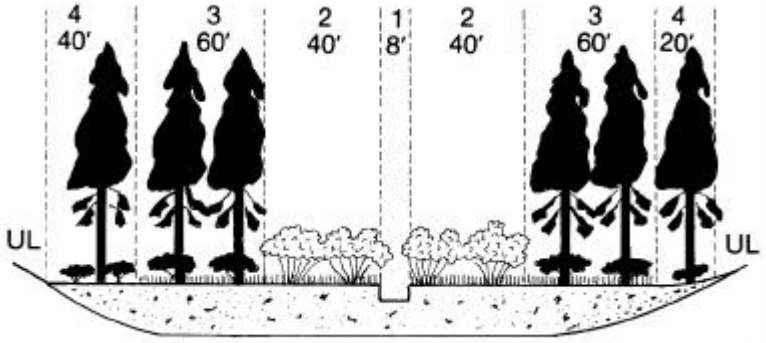
Upland vegetation types adjacent to sites sampled are: dry white fir (*Abies concolor*), low sagebrush (*Artemisia arbuscula*), lodgepole pine, and true fir (*Abies* spp.)-hemlock (*Tsuga* spp.) association.

Successional Dynamics

With overuse by livestock, Douglas spiraea decreases in cover with soil disturbance and soil compaction. Herbs such as Kentucky bluegrass and forbs increase in cover in response to decreasing cover of widefruit sedge and lowered water tables. Widefruit sedge and other graminoids respond well to rest and late season grazing on sites in mid seral or better ecological status. Wildfire was probably fairly common in this association. Soils usually are surface dry in August, allowing fire to encroach from adjacent uplands. Lodgepole pine is sensitive to all but cool ground fires. The shrubs and herbs are well adapted for regeneration following fire. There may be a dramatic increase in willow cover following reduction in conifer cover.

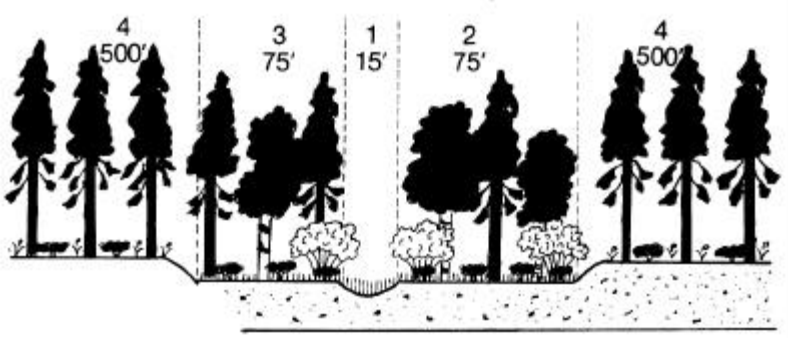
Other Studies Documenting Association with Plot Data
Oregon: Kovalchik 1987: 35

1 Spruce Creek, second-order
2 **Booth willow-Geyer's willow/widefruit sedge**, active floodplain
3 **Lodgepole pine/Douglas spiraea/widefruit sedge**, inactive floodplains
4 **Lodgepole pine/Douglas spiraea**, transitional



Spruce Creek; low gradient, moderate elevation floodplain; East Cascades Ecoregion

1 **Widefruit sedge**, swale
2 **Quaking aspen-lodgepole pine/Douglas spiraea/widefruit sedge**, active floodplain
3 **Lodgepole pine/Douglas spiraea/widefruit sedge,** active floodplain
4 **Lodgepole pine/Douglas spiraea**, terrace



Unnamed drainage between Highway 97 and Williamson River; low gradient, moderately low elevation floodplain; East Cascades Ecoregion

Pinus contorta var. latifolia/Carex angustata Association

Lodgepole pine/Widefruit sedge Association
8 plots. CEGL000140 (same as *Pinus contorta/Carex aquatilis* in NVC)

Ecoregional Range
EC

Environment and Soils

The Lodgepole pine/Widefruit sedge Association is strongly associated with deep pumice mantles. It is similar to the Engelmann spruce-Widefruit sedge Association but occurs below the elevational distribution of Engelmann spruce. Elevations are low to moderate. Landforms include: 1) forested floodplains along streams such as the Deschutes River, Crescent Creek, Little Deschutes River, Falls Creek, Meadow Creek, Jack Creek, and Spring Creek; 2) small forested basins such as at Slabhouse Spring; 3) the margins of meadows such as O'Connor Meadow (see figure in the Tufted hairgrass Association); and 4) shallow, concave, sub-irrigated drainages. The microrelief is flat to very slightly undulating to concave. Soils are deep pumice alluviums. Most sites have a moderately deep surface horizon of organic loam. Others classify as sandy loams but still have considerable proportions of organic matter in their surface horizons. Subsurface soils are coarse, saturated, erosive pumice. Available water holding capacity is moderately high. The water table is near to slightly above the soil surface in June and July and is within 60-90 cm of the soil surface in September. The local climate for this association is much drier (less precipitation and less snowfall), has a shorter frost-free period, and has greater temperature extremes than the Engelmann spruce/Widefruit sedge Association.

Valley Environment	Average	Range
Elevation (ft)	4576	4200-5020
Plot Slope (%)	3	0-15
Valley Gradient (%)	3	1-15
Local Climate		
Mean Annual Precipitation (in.)	24	20-29
Mean Annual Snowfall (in.)	94	71-114
Mean Annual Temperature (F)	43	--
Mean Minimum Temperature (F)	28	27-31
Mean Maximum Temperature (F)	58	56-59
Median Date of Last Spring Freeze	July 7	June 25-July 17
Median Date of First Fall Freeze	Aug. 21	Aug. 9-Sep. 3
Soil Characteristics		
Current Water Table Depth (cm)	61	5-180
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	2	0-10
Gravel	-	-
Rock	tr	0-5
Cryptogam	7	0-15
Litter	90	80-100

Vegetation Composition

Lodgepole pine is the dominant tree. Other conifers are scattered. Widefruit sedge forms a dense sward in climax stands. Bluejoint reedgrass was co-dominant with widefruit sedge on two plots on wetter sites. Kentucky bluegrass was present on all stands and will increase in cover with overgrazing or lowering of the water table. Other graminoids include Baltic rush, tufted hairgrass, blue wildrye, and fowl bluegrass (*Poa palustris*). The rich forb component includes yarrow, hairy willow-herb, broadpetal strawberry, large-leaved avens, longstalk clover and dandelion. Geyer willow and Douglas spiraea are present on many stands but are low in cover. Estimated herbage production ranged from 1000 to 3000 (2187) lbs/acre dry weight.

Adjacent Vegetation

Upland vegetation types adjacent to sites sampled are: dry white fir and lodgepole pine forests and Ponderosa pine-lodgepole pine stands.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Lodgepole pine (*Pinus contorta*)	100	51	25-80
TREE OVERSTORY-SUBDOMINANTS			
Quaking aspen (*Populus tremuloides*)	13	5	--
TREE UNDERSTORY			
Lodgepole pine (*Pinus contorta*)	88	11	2-30
SHRUBS			
Geyer willow (*Salix geyeriana*)	75	8	3-15
Douglas' spiraea (*Spiraea douglasii*)	63	7	5-12
Wax currant (*Ribes cereum*)	50	1	--
SEDGES and RUSHES			
Widefruit sedge (*Carex angustata*)	100	33	15-60
Baltic rush (*Juncus balticus*)	50	3	2-5
PERENNIAL GRASSES			
Kentucky bluegrass (*Poa pratensis*)	100	10	tr-35
Blue wildrye (*Elymus glaucus*)	50	3	tr-5
Tufted hairgrass (*Deschampsia caespitosa*)	50	2	t-5
PERENNIAL FORBS			
Broadpetal strawberry (*Fragaria virginiana*)	75	4	tr-7
Large-leaf avens (*Geum macrophyllum*)	75	2	tr-5
Dandelion (*Taraxacum officinale*)	63	3	tr-5
Yarrow (*Achillea millefolium*)	63	3	tr-5
Longstalk clover (*Trifolium longipes*)	50	7	2-15
Meadow arnica (*Arnica chamissonis*)	50	3	tr-5
Slender cinquefoil (*Potentilla gracilis*)	50	2	t-5
Small cleavers (*Galium trifidum*)	50	2	tr-5
Western mountain aster (*Aster spathulatum*)	50	2	tr-5
Oregon checkermallow (*Sidalcea oregana*)	50	tr	--
Hairy willow-herb (*Epilobium ciliatum*)	50	tr	--

Successional Dynamics

With overuse by livestock, species such as Kentucky bluegrass, bluejoint reedgrass, blue wildrye, and a complex mixture of forbs become co-dominant with widefruit sedge. The soil surface is somewhat trampled and broken. With continued overuse, streambank erosion and streambed downcutting may lead to lowering of the water table. Under such hydrologic conditions the site potential is often changed to the Lodgepole pine/Kentucky bluegrass community type. Wildfire was probably infrequent in this association. Lodgepole pine is sensitive to all but the coolest ground fire. Widefruit sedge will regenerate from rhizomes.

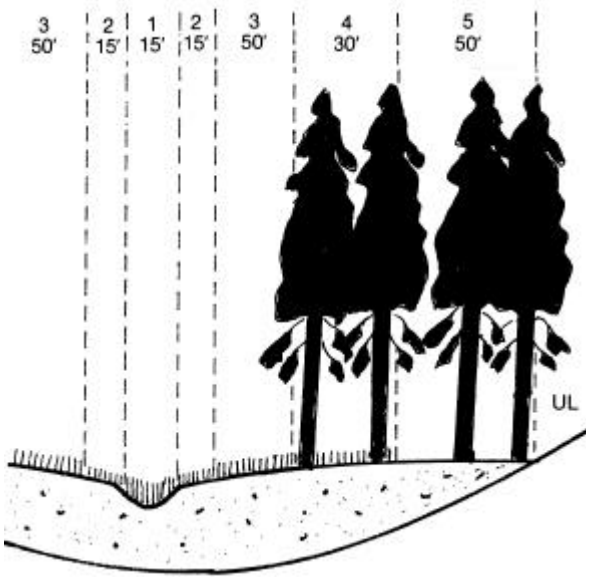
Other Studies Documenting Association with Plot Data

Oregon: Kovalchik 1987:41

Other Studies Documenting Association without Plot Data

Oregon: Titus and Christy 1996a, 1999

Illustrations



1 Jack Creek, intermittent stream
2 **Beaked sedge**, overflow channel
3 **Widefruit sedge**, active floodplain
4 **Lodgepole pine/widefruit sedge**, inactive floodplain
5 **Lodgepole pine/bearberry-mountain gooseberry**, transition slope

Jack Creek; low gradient, mod elevation floodplain; East Cascades Ecoregion

Pinus contorta var. latifolia/Carex aquatilis Association

Lodgepole pine/Aquatic sedge Association
7 plots. CEGL000140 (same as *Pinus contorta/Carex angustata* in NVC)

Ecoregional Range
BM, EC

Environment and Soils

The Lodgepole pine/Aquatic sedge Association is abundant in the southeastern East Cascades Ecoregion and at moderate to high elevations in the central Blue Mountains Ecoregion. The association is found in landforms supporting active floodplains, shores of lakes and ponds, and forested basins. Microtopography is flat, smooth to slightly undulating, or slightly concave. Sample plots were located at Cougar, Mud, Crazy, and Grey Creeks and a pond near Campbell Lake. Valleys are flat, low to moderate gradient and moderately wide to wide. This association is also illustrated in figures in the Creeping spikerush Perennial Stream/Pond and Booth willow-Geyer willow/Aquatic sedge associations. Surface textures range from sandy loam to silt loam. One plot had a thin layer of sedge peat on top of a sandy loam subsurface soil at the edge of a pond. Available water holding capacity is moderate to high. The water table is near to slightly above the soil surface in June and is within 60 cm of the surface in August and September.

Valley Environment	Average	Range
Elevation (ft)	5726	4620-6750
Plot Slope (%)	2	1-5
Valley Gradient (%)	3	1-5
Local Climate		
Mean Annual Precipitation (in.)	28	22-33
Mean Annual Snowfall (in.)	124	68-158
Mean Annual Temperature (F)	41	40-43
Mean Minimum Temperature (F)	29	28-31
Mean Maximum Temperature (F)	54	52-55
Median Date of Last Spring Freeze	July 1	June 26-July 8
Median Date of First Fall Freeze	Aug. 31	Aug. 27-Sep. 6
Soil Characteristics		
Current Water Tables Depth (cm)	47	15-71
Soil Surface Cover (%)		
Submerged	8	0-15
Bare Ground	13	0-30
Gravel	-	-
Rock	tr	0-5
Cryptogam	34	5-90
Litter	50	0-90

Vegetation Composition

Lodgepole pine is sole dominant tree in this association. Quaking aspen, Ponderosa pine, white fir and grand fir, if present, are scattered individuals. Willows were present in some wetter stands. The ground cover is dominated by a dense sward of aquatic sedge. Common grasses include tufted hairgrass, Kentucky bluegrass, meadow barley (*Hordeum brachyantherum*), blue wildrye (*Elymus glaucus*), tall mannagrass (*Glyceria striata*), and alpine timothy (*Phleum alpinum*). Forbs include yarrow, large-leaf avens, Wood's strawberry, western polemonium, white bog-orchid, Gray's licoriceroot, and longstalk clover. Average height of herbaceous layer is 38 cm, ranging from 36-41 cm. Average herbaceous biomass is 1101 lbs/acre, ranging from 969-1233 lbs/acre. Estimated herbage production ranged from 1000 to 2500 (1800) lbs/acre dry weight.

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are lodgepole pine, grand fir and Ponderosa pine associations.

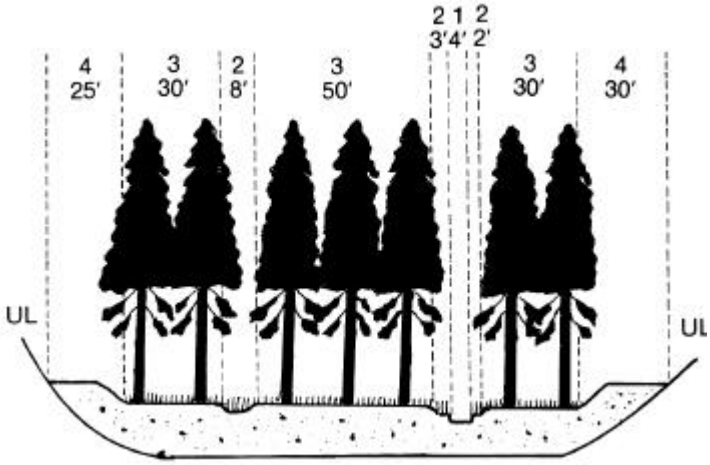
Successional Dynamics
With overuse by livestock, trampling and grazing reduces the competitive ability of aquatic sedge, eventually leading to co-dominance by Kentucky bluegrass, other grasses, and forbs. On moist sites, species such as northern reedgrass (*Calamagrostis neglecta*), meadow arnica (*Arnica chamissonis*), and common horsetail (*Equisetum arvense*) are prominent. On drier sites, species such as Kentucky bluegrass, meadow barley (*Hordeum brachyantherum*), timothy (*Phleum pratense*), broadpetal strawberry (*Fragaria virginiana*), Gray's licoriceroot, or longstalk clover become prominent. The soil surface is somewhat broken and trampled. Continued overuse by livestock may lead to increased streambank erosion and streambed downcutting, thus leading to lowered water tables. Under these hydrologic conditions the site potential may be changed to the Lodgepole pine/Kentucky bluegrass community type or, at higher elevations, forbs become prominent in the ground layer.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Lodgepole pine (*Pinus contorta*)	100	37	4-70
TREE OVERSTORY-SUBDOMINANTS			
Lodgepole pine (*Pinus contorta*)	29	15	4-25
TREE UNDERSTORY			
Lodgepole pine (*Pinus contorta*)	100	10	2-35
SHRUBS			
Prickly currant (*Ribes lacustre*)	57	3	tr-7
SEDGES and RUSHES			
Aquatic sedge (*Carex aquatilis* var. *aquatilis*)	100	37	10-75
Field woodrush (*Luzula campestris*)	57	2	tr-5
Nevada rush (*Juncus nevadensis*)	57	2	tr-3
Small-flowered woodrush (*Luzula parviflora*)	57	1	tr-2
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	71	3	tr-5
Kentucky bluegrass (*Poa pratensis*)	57	6	tr-15
PERENNIAL FORBS			
Yarrow (*Achillea millefolium*)	100	2	tr-5
Longstalk clover (*Trifolium longipes*)	86	6	2-12
Dandelion (*Taraxacum officinale*)	71	2	tr-5
Large-leaf avens (*Geum macrophyllum*)	71	1	tr-3
Wood's strawberry (*Fragaria vesca*)	57	10	1-20
Gray's licorice-root (*Ligusticum grayi*)	57	4	tr-6
Western polemonium (*Polemonium occidentale*)	57	3	tr-5
White bog-orchid (*Habenaria dilatata*)	57	tr	--

Wildfire is somewhat infrequent in this association. Burned stands will regenerate to lodgepole pine. Aquatic sedge will regenerate from rhizomes. Overstory removal on wetter sites may result in elevated water tables and temporary conversion of the site potential to the willow/aquatic sedge association.

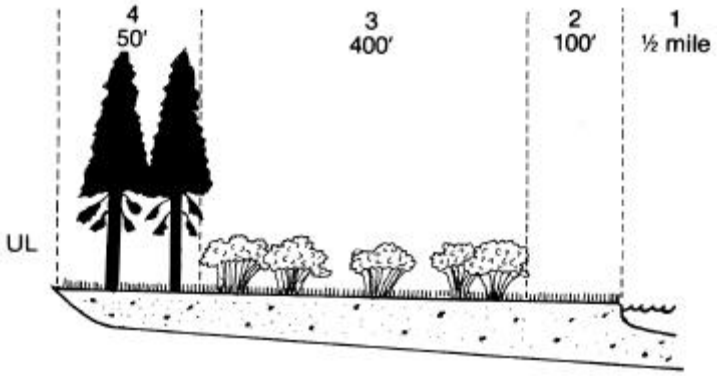
Other Studies Documenting Association with Plot Data
Oregon: Volland 1976:32, Kovalchik 1987: 43; Crowe and Clausnitzer 1997: 50; Titus and Christy 1996a, 1999

Illustrations



1 Cougar Creek, first-order
2 **Aquatic sedge**, active channel shelves and overflow channels
3 **Lodgepole pine/aquatic sedge**, inactive and active floodplains
4 Floodplain terraces with upland vegetation

Cougar Creek; low gradient, moderate-high elevation floodplain; Basin and Range Ecoregion



1 Cottonwood Lake
2 **Aquatic sedge**, wet meadow
3 **Booth willow-Geyer willow/aquatic sedge**, wet shrub meadow
4 **Lodgepole pine/aquatic sedge**, forested wetland

Cottonwood Lake; flat, moderate-high elevation, lake basin; Basin and Range Ecoregion

*Pinus contorta var. latifolia/Calamagrostis canadensis Association**

Lodgepole pine/Bluejoint reedgrass Association
1 plot. CEGL000138

Ecoregional Range
BM, EC

Environment and Soils
This association occurs at moderate elevations in the Blue Mountains and East Cascades Ecoregion. The sampled location is streamside seep at 4750 feet elevation with a plot surface slope of 3%. The soil is composed of organic-rich loam. The water table depth was 109 cm at the time of sampling. The soil surface is covered by moss (63%) and litter (37%).

Vegetation Composition
The stand is dominated by lodgepole pine with bluejoint reedgrass (averaging 66 cm in height) in the understory. Sitka burnet, swamp onion, American twinflower, and bog birch are prominent understory members. Herbaceous biomass was 1267 lbs/acre.

Dominant Species	Canopy Cover (%)
TREE OVERSTORY-DOMINANTS	
Lodgepole pine (*Pinus contorta*)	30
TREE OVERSTORY-SUBDOMINANTS	
Lodgepole pine (*Pinus contorta*)	4
TREE UNDERSTORY	
Lodgepole pine (*Pinus contorta*)	3
SHRUBS	
Bog birch (*Betula nana*)	30
Twinflower (*Linnaea borealis*)	10
SEDGES and RUSHES	
Aquatic sedge (*Carex aquatilis* var. *aquatilis*)	3
Bladder sedge (*Carex utriculata*)	3
PERENNIAL GRASSES	
Bluejoint reedgrass (*Calamagrostis canadensis*)	80
PERENNIAL FORBS	
Sitka burnet (*Sanguisorba sitchensis*)	40
Swamp onion (*Allium validum*)	3
Fireweed (*Chamerion angustifolium*)	tr
Bog St. John's wort (*Hypericum anagalloides*)	tr
White bog-orchid (*Habenaria dilatata*)	tr

Adjacent Vegetation
The upland vegetation adjacent to this sample site is a grand fir association.

Other Studies Documenting Association with Plot Data
Oregon: Crowe and Clausnitzer 1992
Utah: Mauk and Henderson (1984) describe a similar community type in northern Utah.

Pinus contorta var. latifolia/Deschampsia caespitosa

Lodgepole pine/Tufted hairgrass Association
5 plots. CEGL000147

Ecoregional Range
BM, EC

Environment and Soils

The Lodgepole pine/Tufted hairgrass occurs at moderate to moderately high elevations in the Blue Mountains and East Cascades Ecoregion. Sites are forested basins and terraces in cold, flat, wide, flat- and trough-shaped valleys with gentle sideslopes. Soils range from silt loams to sands. On site had a 35 cm thick histic epipedon. Soils are seasonally wet to within 30 cm of the surface with the water table retreating to 75 cm by the middle of the growing season.

Valley Environment	Average	Range
Elevation (ft)	5140	4600-6000
Plot Slope (%)	0.7	0-2
Valley Gradient (%)	1.5	1-2
Local Climate		
Mean Annual Precipitation (in.)	50	23-84
Mean Annual Snowfall (in.)	189	101-314
Mean Annual Temperature (F)	42	40-45
Mean Minimum Temperature (F)	30	28-33
Mean Maximum Temperature (F)	55	50-57
Median Date of Last Spring Freeze	June 26	June 5-July 7
Median Date of First Fall Freeze	Sep. 3	Aug. 25-Sep. 19
Soil Characteristics		
Current Water Table Depth (cm)	85	40-140
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	4	0-10
Gravel	0	-
Rock	tr	0-1
Cryptogam	6	0-15
Litter	90	79-99

Vegetation Composition

Lodgepole pine forms the scattered to dense tree overstory with a scattered understory of seedlings and saplings. Tufted hairgrass (averaging 50 cm in height) dominates the herbaceous layer. Other herbaceous species, such as Baltic rush, yarrow, broadpetal strawberry, longstalk clover and western aster are sparsely to abundantly scattered through the site.

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Lodgepole pine (*Pinus contorta*)	100	35	20-50
TREE OVERSTORY-SUBDOMINANTS			
Lodgepole pine (*Pinus contorta*)	20	30	--
TREE UNDERSTORY			
Lodgepole pine (*Pinus contorta*)	100	16	3-25
SEDGES and RUSHES			
Baltic rush (*Juncus balticus*)	60	5	tr-10
PERENNIAL GRASSES			
Tufted hairgrass (*Deschampsia caespitosa*)	100	32	15-60
Timber oatgrass (*Danthonia intermedia*)	60	11	2-25
PERENNIAL FORBS			
Yarrow (*Achillea millefolium*)	60	8	tr-20
Broadpetal strawberry (*Fragaria virginiana*)	60	3	tr-5
Longstalk clover (*Trifolium longipes*)	40	9	2-15
Western aster (*Aster spathulatum*)	40	5	tr-10

Adjacent Vegetation
Upland vegetation types adjacent to sites sampled are: grand fir/pinegrass, lodgepole pine, mountain hemlock and true fir-hemlock associations.

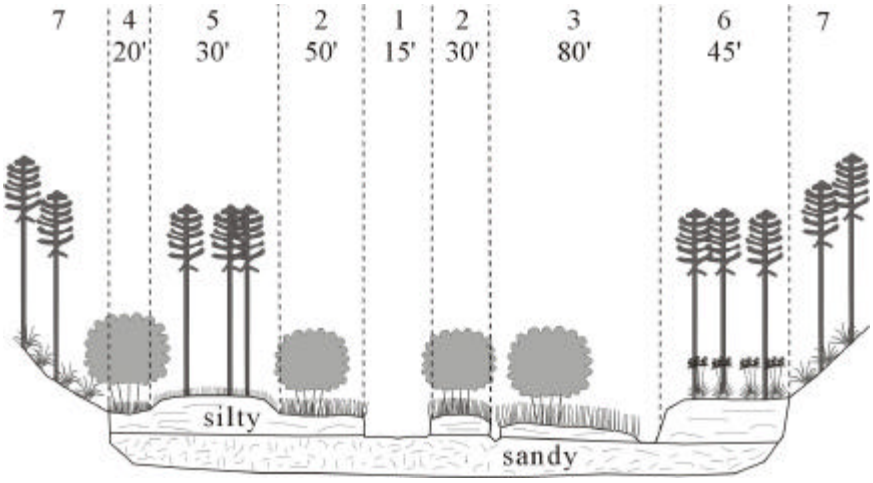
Successional Dynamics
The association develops in the Tufted hairgrass Association where establishment conditions are favorable for and lodgepole pine. These conditions may be a lack of fire or a lowering of the groundwater table. Livestock grazing and bedding activities appear to rapidly reduce the competitive ability of tufted hairgrass in favor of Kentucky bluegrass and the site will convert to the Lodgepole pine/Kentucky bluegrass community type.

Other Studies Documenting Association with Plot Data
Oregon: Kovalchik 1987: 136; Crowe and Clausnitzer 1997: 50.
California: Weixelman *et al.* 1999: 4-82

Other Studies Documenting Association without Plot Data
Oregon: Titus and Christy 1996a, 1999

Illustrations

1 E6 stream reach
2 **Booth willow-Geyer willow/aquatic sedge**, floodplain
3 **Booth willow-Geyer willow /bladder sedge**, floodplain swale
4 **Booth willow-Geyer willow /aquatic sedge**, overflow swale
5 Lodgepole pine/Kentucky bluegrass, terrace
6 **Lodgepole pine/tufted hairgrass**, terrace
7 Lodgepole pine/pinegrass, west and east-facing sideslopes



Bear Creek, Bear Valley RD, Malheur NF; very low gradient, moderate elevation, flat-shaped valley; Blue Mountains Ecoregion

Pinus contorta var. latifolia/Arctostaphylos uva-ursi-Ribes montigenum Association

Lodgepole pine/Bearberry-mountain gooseberry Association
9 plots. CEGL000134

Ecoregional Range
EC

Environment and Soils

The Lodgepole pine/Bearberry Association is one of the driest Lodgepole pine Associations described for eastern Oregon. It occurs on imperfectly drained, low gradient landforms on the edges of meadows, forested drainages, and basins. Elevations are low to moderate. Other figures illustrating this association are found in the discussions for Cusick bluegrass and Lodgepole pine/Widefruit sedge Associations. Surface soils are air laid or flow pumice over buried soils from alluvium, lava, or tuff. Surface profile textures range from loamy coarse sand to sandy loam. This often grades into a coarse sandy C horizon that is moist throughout the year. Available water holding capacity is low. In May and June, water levels lie within 60 cm of the soil surface but lower to 120-150 cm below the soil surface in August.

Valley Environment	Average	Range
Elevation (ft)	5102	4250-6300
Plot Slope (%)	2	0-10
Valley Gradient (%)	3	1-10
Local Climate		
Mean Annual Precipitation (in.)	28	21-43
Mean Annual Snowfall (in.)	114	77-43
Mean Annual Temperature (F)	43	41-44
Mean Minimum Temperature (F)	29	27-31
Mean Maximum Temperature (F)	56	52-59
Median Date of Last Spring Freeze	July 5	June 27-July 10
Median Date of First Fall Freeze	Aug. 26	Aug. 18-Sep. 2
Soil Surface Cover (%)		
Submerged	-	-
Bare Ground	7	0-37
Gravel	tr	0-2
Rock	-	-
Cryptogam	3	0-15
Litter	90	58-100

Vegetation Composition

The Lodgepole pine/bearberry-mountain gooseberry Association is dominated by lodgepole pine and bearberry or mountain gooseberry. Other conifers are not capable of dominating these cold basin sites. Other shrubs include wax currant, bitterbrush, and Douglas spiraea but are scattered sub-ordinants to bearberry. Common grasses are timber oatgrass (*Danthonia intermedia*), squirreltail bottlebrush (*Elymus elymoides*), western needlegrass (*Achnatherum occidentale*), and Ross' sedge (*Carex rossii*). Forbs include long-stalk clover, yarrow, fireweed and stream buttercup.

Successional Dynamics

With overuse by livestock, bearberry decreases in cover with soil disturbance and soil compaction. The herbaceous layer becomes dominated by bare ground rather than a dramatic increase in the cover of graminoids and forbs. Lodgepole pine is killed by all but the coolest ground fires while bearberry is moderately resistant to fire. Lodgepole pine reproduces from prolific seed after fire. Bearberry reproduces from its abundant fleshy seed and by stem budding from its shallow roots (Volland 1981). Cool, light prescribed fire will assure maximum survival of lodgepole pine and regeneration of bearberry.

Adjacent Vegetation

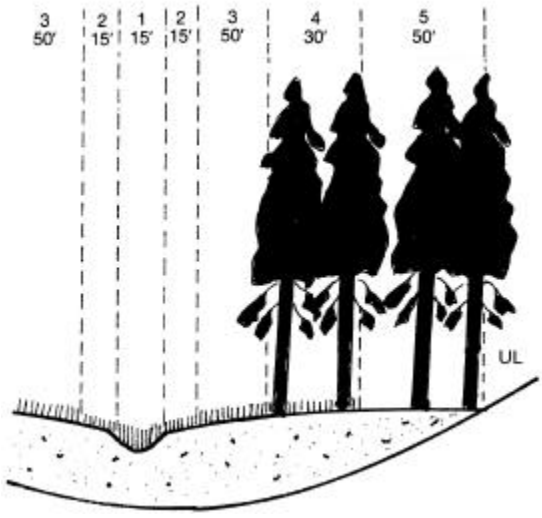
Upland vegetation types adjacent to sites sampled are: dry white fir, lodgepole pine, and Ponderosa pine associations.

Other Studies with Plot Data
Oregon: Volland 1976: 34, Kovalchik 1987: 31

Dominant Species	Constancy (%)	Canopy Cover (%)	
		Average	Range
TREE OVERSTORY-DOMINANTS			
Lodgepole pine (*Pinus contorta*)	89	46	30-70
TREE OVERSTORY-SUBDOMINANTS			
White fir (*Abies concolor*)	22	15	--
Quaking aspen (*Populus tremuloides*)	22	10	5-15
Lodgepole pine (*Pinus contorta*)	11	15	--
TREE UNDERSTORY			
Lodgepole pine (*Pinus contorta*)	100	10	2-40
SHRUBS			
Bearberry (*Arctostaphylos uva-ursi*)	78	21	5-40
Mountain gooseberry (*Ribes montigenum*)	22	15	--
Douglas' spiraea (*Spiraea douglasii*)	56	5	1-7
Dwarf huckleberry (*Vaccinium caespitosum*)	44	6	1-15
Wax currant (*Ribes cereum*)	44	5	1-15
PERENNIAL FORBS			
Broadpetal strawberry (*Fragaria virginiana*)	89	5	3-7
Long-stalk clover (*Trifolium longipes*)	78	8	2-20
Yarrow (*Achillea millefolium*)	78	3	tr-5
Fireweed (*Chamerion angustifolium*)	78	1	tr-3
Stream buttercup (*Ranunculus uncinatus*)	44	8	2-15
Littleleaf pussytoes (*Antennaria microphylla*)	33	6	2-10
Starry false Solomon's seal (*Maianthemum stellata*)	33	3	2-5
Streambank butterweed (*Senecio pseudaureus*)	33	3	2-3

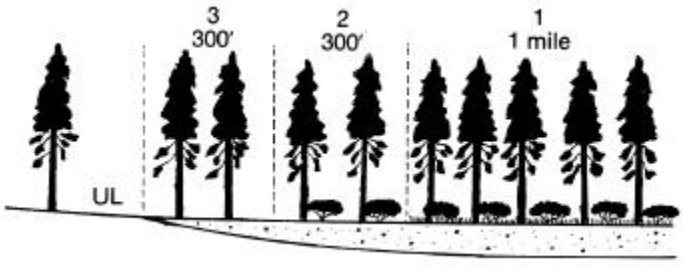
Illustrations

1 **Bladder sedge**, Jack Creek, intermittent
2 **Widefruit sedge**, moist meadow
3 Kentucky bluegrass (**Tufted Hairgrass** potential), dry meadow
4 **Lodgepole pine/Kentucky bluegrass**, invasion into **tufted hairgrass**
5 **Lodgepole pine/bearberry-mountain gooseberry**, transitional



Jackie's Thicket; flat, moderate elevation basin; East Cascades Ecoregion

1 **Lodgepole pine/bog blueberry/widefruit sedge**, forested wetland
2 **Lodgepole pine/bog blueberry**, transitional
3 Lodgepole pine/bearberry-mountain gooseberry, transitional



Jack Creek; low gradient, moderate-low elev. floodplain East Cascades Ecoregion

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APPENDIX 1. GLOSSARY

(Adapted from Kovalchik 2001; Crowe and Clausnitzer 1997; Hansen et al. 1995; and Kovalchik 1987)

Abandoned (meander) channel. A former stream or river channel that was cut off from the rest of the stream or river and often lacks year-long standing water.

Abundant. When relating to plant coverage in the association key, any species having a canopy coverage of 25 percent or more in a stand.

Accidental (incidental). A species that is found rarely or occasionally as scattered individuals in an association (often as a random or chance occurrence).

Aerobic. Conditions in which molecular oxygen is present in the soil environment.

Alkaline. Water or soil with a pH greater than 7.4.

Alluvial bar. An elongated landform formed by waves and currents, usually running parallel to the shore and composed predominantly of unconsolidated sand, gravel, stones, cobbles, or stone. Examples include:

Point bars – Bars that are formed on the inside of meander channels.

Side bars – Bars that are formed along the edges of relatively straight sections of rivers

Mid-channel bars – Bars found within the channel that become more noticeable during low flow periods.

Delta bars – Bars formed immediately downstream of the main confluences of a tributary and the main channel.

Alluvial soil. Sediments (clay, silt, sand, gravel, cobbles, and boulders) deposited by running water, ordinarily occurring on floodplains but also on terraces during extremely large flood events.

Alluvial terrace. Deposits of alluvial soil that mark former floodplains. Typically, a valley bottom may have several sets of terraces at different elevations and of different ages (generally, the higher the elevation, the older the age).

Alluvium. An accumulation of sediments deposited by streams and rivers.

Alpine. Elevation ranges found above the upper limits of (erect) tree growth.

Anaerobic. A condition in which molecular oxygen is absent from the soil environment. This commonly occurs in wetlands, especially bogs, where soils experience prolonged saturation by water.

Andisols. Thick mineral soils developed in volcanic ash, cinders, other volcanic ejecta, or volcaniclistic materials.

Aquatic ecosystem. The stream channel or lake bed, the water, and the vegetative communities associated with them, forming an interacting system.

Association. See plant association.

Available water holding capacity. The capacity of a soil to hold water in a form available to plants, expressed in inches of water per inch of soil depth. Commonly defined as the amount of water held between field capacity and wilting point. The classes are:

Low = 0 - 0.12

Moderate = 0.13 - 0.17

High > 0.17

Backwater area. Seasonal or permanent water bodies found in the lowest parts of floodplains.

Bank. The sloping land bordering a channel. The bank has a steeper slope than the bottom of the channel and is usually steeper than the land surrounding the channel. The portion of the channel cross-section that controls the lateral movement of water.

Basin. A depression or hollow in the land surrounded by higher ground.

Beaver dams. Dams built by beavers that span the stream channel. In general, water is still flowing through the riparian wetland system.

Bog. A soil and vegetation complex in which the lower parts are dead peat, gradually changing upwards to living plant tissues. This soil is usually saturated, relatively acidic, and dominated at ground level by mosses. Bogs may be either forested or open. They are distinguished from swamps and fens by the dominance of mosses and the presence of peat deposits. Bogs are usually a sphagnum moss-dominated community whose only water source is rainwater. Bogs are extremely low in nutrients, form acidic peat soil, and are a northern phenomenon generally associated with low temperatures, anaerobic conditions, and short growing seasons.

Browse. Shrubby or woody forage consumed by wildlife.

Canopy cover. The ground area covered by the generalized outline of an individual plant's foliage, or collectively covered by all individuals of a species within a stand or sample area. Canopy coverage is expressed as a percentage of the total area of the plot.

Average canopy cover. Refers to the "average" canopy cover of a particular species for the stands that it was recorded. For example, the number of stands sampled for a particular plant association may be 20. However, a particular species may occur in only 7 or the 20 stands. The average canopy cover therefore represents the "average" canopy cover of that species in the seven stands.

Canyon. A long, deep, narrow, very steep sided valley with high and precipitous walls and high local relief.

Capillary fringe. A zone immediately above the water table in which water is drawn upward from the water table by capillary action.

Carr. A shrub-dominated wetland on organic soil. It is also referred to as a shrub carr. Carrs in eastern Oregon are typically dominated by willows, bog blueberry, bog birch or mountain alder (or occasionally by red-osier dogwood or Douglas' spiraea). Peat and/or other mosses are sometimes present.

Caudex. A short, more or less vertical, often woody, persistent stem at or just beneath the ground surface.

Channel. An open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water.

Classification. The orderly arrangement of objects according to their differences and similarities.

Clay. Soil with rock fragments less than 0.002 mm in diameter.

Climax. Climax is usually defined as the plant community that will come to occupy a site under existing climate, soils, and topographic conditions. It is the "stable state" where change in the vegetation is minimal over time and competition is so great from dominant species that "invaders" are excluded and "increasers" are held to low levels.

Climax species. A species that is self-regenerating in the absence of disturbance, with no evidence of replacement by other species.

Cobbles. Soils with rock fragments 7.6 cm (3 inches) to 25.4 cm (10 inches) in diameter.

Colluvial. Pertaining to material transported and deposited by gravitational action and local unconcentrated runoff at the base of steep slopes.

Colluvium. Unconsolidated earth material deposited on and at the base of steep slopes by gravitational action and local unconcentrated runoff on and at the base of steep slopes.

Common. When relating to plant coverage, any species having a canopy coverage of one (1) percent or more in a stand.

Community (plant community). An assemblage of plants occurring together at any point in time, thus denoting no particular ecological status.

Community type. An aggregation of all plant communities distinguished by floristic and structural similarities in both overstory and undergrowth layers. In this classification, it is used to name naturalized riparian communities such as reed canarygrass or seral communities such as small-fruited bulrush.

Constancy. The percentage of sampled stands in which a species occurs.

Depauperate. Describing an unusually sparse coverage of undergrowth vegetation. This condition usually develops beneath an especially dense forest canopy, often on sites having a deep layer of duff.

Disturbed. Directly or indirectly altered by humans from a natural condition, yet retaining some natural characteristics.

Diversity. The number and amount of species in a community per unit area.

Dominant. The species controlling the environment.

Drained. A condition in which ground or surface water has been removed by artificial means.

Ecological status. The degree of departure of the current vegetation from climax. The cause of departure is not considered; therefore, ecological status may include, but is not limited to, the concept of range condition. The only consideration is the difference in species density and composition between existing and climax vegetation. Three classes are used: Late Seral, Mid Seral and Early Seral

Ecosystem. A complete interacting system of organisms and their environment.

Ecotone. The boundary between adjacent plant communities.

Edaphic. The climatic status due to soil or topography rather than climate.

Emergent plant. A rooted herbaceous plant species that has parts extending above a water surface.

Emergent wetland. A class of wetland habitats characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens (Cowardin and others 1979).

Entisol. Soils that have little or no evidence of horizon development, usually as a result of recent flood deposition. Entisols encountered during this study belong to the Cryofluvent subgroup.

Ephemeral stream. A stream or stretch of stream that flows only in response to precipitation. It receives no water from springs and no long-continued supply from melting snow or other surface source. Its stream channel is at all times above the water table. These streams do not normally flow for more than 30 days.

Epipedon. Diagnostic soil surfaces formed at the soil surface.

Erosion. The wearing of land surfaces by running water, waves, moving ice and wind, or by such processes as mass wasting and corrosion.

Facultative plants (FAC). A plant species that is equally likely to occur in wetlands or nonwetlands (estimated probability 1-33 percent).

Facultative upland plants (FACU). A plant species that usually occurs in nonwetlands (estimated probability 67- 99 percent), but is occasionally found in wetlands (estimated probability 1-33 percent).

Facultative wetland plants (FACW). A plant species that usually occurs in wetlands (estimated probability 67-99 percent), but is occasionally found in nonwetlands (estimated probability 1-33 percent)

Fen. A peatland dominated by graminoids, sometimes with sparse scattered shrubs or trees. The water table is at the surface most of the year. There may be a flow of groundwater upward through the peat. These soils usually have a neutral pH, are mineral- and oxygen-rich and intergrade with bog and marsh.

Flooded. A condition in which the soil surface is temporarily covered with flowing water from any source, such as streams overflowing their banks and runoff from adjacent surrounding slopes.

Floodplain. The nearly level alluvial plain that borders a stream. It is usually a constructional landform built of recent sediment deposited during overflow and lateral migration of the stream. In this classification it refers to the alluvial plain immediately adjacent to the stream influenced by one to three year flooding.

Flood storage. The process by which peak flows (from precipitation, runoff, groundwater discharge, etc.) enter a wetland and are delayed in their down slope journey.

Fluvial. Pertaining to or produced by the action of a stream or river.

Fluvial surfaces. The various land surfaces associated with the riparian zone such as point bars, floodplains, streambanks, terraces and overflow channels.

Foothills. Steeply sloping uplands (with hill relief up to 1000 ft) that fringe a mountain range or high plateau escarpment.

Forage condition. An ecological concept used to interpret livestock grazing impacts on vegetation. It describes the departure from potential under existing environmental conditions and assumes a causal relationship between the vegetation and domestic ungulate grazing.

Forb. Any herbaceous plant, usually broad-leaved, that is not a grass or grass-like plant.

Forested wetland. A class of wetland habitat characterized by woody vegetation that is 6 m (20 ft) tall or taller (Cowardin and others 1979).

Frequently flooded. A class of flood frequency in which flooding is common in most years (more than a 50 percent chance of flooding in any year, or more than 50 times in 100 years).

Freshwater impounded wetland. A palustrine or lacustrine wetland formed in a topographic depression, or by the natural or artificial damming of a river, stream, or other channel.

Gallery forest. A strip of forest confined to a stream margin or floodplain in an otherwise unforested landscape.

Geomorphic surface. A mappable part of the land surface that is defined in terms of morphology origin, age, and stability of component landforms.

Geomorphology. The science that treats the general configuration of the Earth's surface; specifically the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures, and of the history of geologic changes as recorded by these surface features.

Glacial outwash. Stratified sand and gravel carried, sorted, and deposited by water that originated mainly from the melting of glacial ice.

Glacial till. Unsorted, unstratified glacial drift, generally unconsolidated, deposited directly by a glacier without subsequent reworking by water from the glacier.

Gleyed soils. Soils having an intense reduction of iron during soil development, or reducing conditions due to stagnant water, as indicated by base colors that approach neutral (bluish, grayish, or greenish), with or without mottles. In the more extreme condition, ferrous iron is present.

Graminoid. Refers to grass or grass-like plants such as grasses, sedges, and rushes.

Gravel. A soil mixture composed primarily of rock fragments 2 mm (0.08 inch) to 7.6 cm (3 inches) in diameter. Usually contains much sand.

Groundwater. Water occupying the interconnected pore spaces in the soil or geologic material below the water table; this water has a positive pressure.

Growing season. The portion of the year when soil temperatures are above biological zero (41 degrees Fahrenheit) as defined by Soil Taxonomy.

Herbaceous. Non-woody vegetation such as grasses and forbs.

Herbaceous biomass. The aboveground biomass (air-dried pounds per acre) of all grasses, sedges, and forbs; no allowance is made for proper use factors.

Histosols. A soil order composed of organic soils (peats and mucks) with generally greater than 50 percent organic matter in the upper 80 cm (32 inches), or that are of any thickness if overlaying rock. This classification violates the 80 cm rule, as some organic soils in eastern Washington have not developed sufficient thickness to meet the rule in the post-glacial period yet all the soil within the plants rooting zone is organic. Suborders are distinguished by the degree of decomposition of organic material and the presence of moss fibers:

Fibric - Plant remains are so little decomposed that at least three-fourths (by volume) are not destroyed by rubbing and their botanical origin can be determined.

Hemic - Organic materials are intermediate in decomposition between fibric and sapric. About one-half of the organic fibers are destroyed by rubbing the soil between the fingers.

Sapric - Consists of highly decomposed plant remains. At least five-sixths of the fibers rub smooth. The botanic origin cannot be determined. Soils are usually black and consist of the residue that remains after aerobic decomposition on sites with widely fluctuating water tables.

Limnic - Consists of thick layers of sedimentary organic material on the bottoms of lakes or ponds. The fibers rub smooth. Usually olive to olive brown color. Formed under totally anaerobic decomposition.

Hydric soil (USDA SCS 1990). A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part of the soil profile. Hydric soil indicators are Histisol, histic epipedon, sulfuric odor, aquic moisture regime, reducing conditions, gleyed or low-chroma colors, concretions, high organic content, and listing on local Hydric Soils List (Environmental Laboratory 1987).

Hydrophyte. Any macrophytic plant that grows in water or on a substrate that is at least potentially deficient in oxygen as a result of excessive water content; plants typically found in wetland or aquatic habitat.

Impounded. Bodies of water formed in a topographic depression or by the natural or artificial damming of a river, stream, or other channel.

Inceptisol. Soils that lack the mollic epipedon and have high available water throughout the growing season. Textures are finer than loamy sand, and the altered horizons have lost bases but retain some weatherable minerals. Surface horizons are gray to black and are high in carbon.

Indicator plant or species. A plant whose presence or abundance indicates certain environmental conditions and the presence of a habitat type, association, or community type.

Intermittent stream. A stream, or reach of a stream, that flows periodically (over time) only when it receives ground water discharge or continued contributions from melting snow or other surface and shallow subsurface sources.

Interrupted stream. A stream, or reach of a stream, that flows periodically (over space). The spatially interrupted flow of the stream is the result of surface water

Inundation. A condition in which water temporarily or permanently covers a lands surface.

Krumholtz. Trees are dwarfed and twisted because of severe climate (wind, low temperature, etc.) at the high elevation limits of forest development.

Lacustrine. Of or relating to permanently flooded lakes and reservoirs, whose total area exceeds 8 hectares (19.768 acres) or whose maximum depth exceeds 2 meters at low water.

Landform. Any element of the landscape characterized by a distinctive surface expression, internal structure or both, and sufficiently conspicuous to be included in a physiographic description.

Long duration flooding. A duration class in which inundation for a single event ranges from 7 days to a month. Low elevation. Elevation ranges generally occurring between sea level and the midmontane zone. NOTE: The upper limit of this region varies with microclimatic conditions and may extend above the base of adjacent foothills.

Marsh. Wetlands where the vegetation is dominated by graminoids, with the water table at or above the surface most of the year and with little or no accumulation of peat.

Meander. A meander is one of a series of sinuous loops, with sine-wave form, in the course of a stream channel. Highly meandering stream channels commonly have cross sections with low width to depth ratios, fine grained bank materials, and low gradient.

Mineral soil. Soil composed of predominantly mineral materials (sands, silts, clays) instead of organic materials. The soil contains less than 20 percent organic matter.

Moderate elevation (midmontane). Elevation zones identified by vegetation that does not extend below the upper elevation of adjacent foothills or into the subalpine. The boundary between the midmontane and subalpine zones varies considerably from one geographical region to another and with microclimatic conditions.

Mollic epipedon. Abstraction of soil properties common to the soils of the steppes of America, Europe, and Asia that focuses its immediate attention on the horizons at or near the surface rather than the deeper ones.

Mollisol. A soil having a dark brown to black surface horizon (mollic epipedon) that is relatively thick; has a high base saturation; and usually well developed structure. The mollic epipedon is the result of underground decomposition of organic residues in the presence of a bivalent cation such as calcium.

Monotypic stands. Stands composed primarily of a single species.

Moraine. A rounded ridge, hill, or mound of rubble left behind by a retreating glacier.

Mottling. Variation of coloration in soils as represented by localized spots, patches, or blotches of contrasting color. Commonly develops under alternating wet and dry periods with associated reduction and oxidation environments. Mottling generally indicates poor aeration and impeded drainage.

Natural. Dominated by native biota and occurring within a physical system which has developed through natural processes without human intervention.

Obligate wetland plants. Refers to a plant species that occurs almost always (estimated probability greater than 99 percent) under natural conditions in wetlands

Organic loam. A generalized name for soils having more than 12 percent organic particles in addition to clay, silt, and sand.

Organic soil. Soils composed of primarily organic rather than mineral material. Equivalent to Histisol.

Overbank flooding. Any situation in which inundation occurs as a result of the water level of a river or stream rising above bank level.

Overflow channel. Secondary channel in a valley that carries water during periods of highest flow in the main channel. Topographic height of this channel is lower than the floodplain. Overflow channels often occur either within the floodplain or between a floodplain and terrace or toeslope.

Oxbow lake. A meander channel of a stream or river that is formed by breaching a meander loop during flood stage. The ends of the cut-off meander are blocked by bank sediments.

Palustrine. Tidal and nontidal wetlands dominated by trees, shrubs, persistent emergent herbs, and emergent mosses or lichens where salinity due to ocean-derived salts is below 0.5 ppt. Also included are wetlands without such vegetation, but with all of the following characteristics: area less than 8 hectares; active wave formed or bedrock shoreline features lacking; maximum water depth less than 2 meters at low water; ocean-derived salinity less than 0.5 ppt.

Parent material. The unconsolidated and undeveloped mineral or organic matter from which the soil is developed.

Peat. Unconsolidated soil material consisting largely of under decomposed or only slightly decomposed organic mater accumulated under conditions of excessive soil moisture.

Moss peat. Peat soil composed of partially decomposed sphagnum and/or other mosses.

Sedge peat. Peat soil composed of partially decomposed graminoids, especially sedges.

Woody peat. Peat soil composed of partially decomposed wood.

Perched water table. Zone of saturated soil that lies above a zone of saturated soil within 80 inches of the soil surface. Also called episaturation.

Perennial stream. A stream that runs aboveground throughout its length and throughout the year.

Permanently flooded. Water covers the land surface throughout the year in all years (may be absent during extreme drought periods).

Pioneer plants. Herbaceous annual and seedling perennial plants that colonize bare areas such as gravel bars as a first stage in secondary succession.

Plant association. Normal usage is a climax community type (Pfister and others 1979). However, in this classification it refers to an assemblage of native riparian and wetland vegetation occurring together in equilibrium with the environment for a given fluvial surface (i.e. the potential natural vegetation on a fluvial surface).

Plant community. See community.

Pond. A small body of water encircled by wetland vegetation. Wave action is minimal, allowing emergent vegetation to establish. Usually less than 3 acres in area.

Ponded. A condition in which free water covers the soil surface. For example, a closed depression. The water is removed only by percolation, evaporation, or transpiration.

Poorly drained. Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods (greater than 7 days).

Poor fen. A peatland that is intermediate in nutrient status and vegetation composition between a fen and a bog. An example is the *Carex lasiocarpa* (CALA4) plant association.

Poorly represented. When relating to plant coverage in the association descriptions, any species that has a canopy coverage less than five (5) percent.

Pothole. A depressional wetland caused by glaciation. The body of water is less than 20 acres in size.

Redox concentrations. A redoximorphic feature characterized by zones in the soil of accumulation of iron and manganese oxides. These may form nodules, concretions, soft bodies, or pore linings and vary in shape, size, and color.

Redox depletions. A Redoximorphic feature characterized by zones in the soil of low chroma (less than 3) where iron and manganese oxides alone have been removed, or where both iron or manganese oxides and clay have been removed.

Redoximorphic features.

Reservoir. An artificial (dammed) water body with at least 8 ha (20 acres) covered by surface water.

Restored. Artificially returned from a disturbed or totally altered condition, to a state that mimics the original, natural condition.

Riparian. (adj.) Of, on, or relating to the banks of a natural course of water. That land, next to running water, where plants dependent on a perpetual source of water occur.

Riparian species. Plant species occurring within the riparian zone.

Riparian wetland. An out-of-channel, palustrine wetland associated with the flowing water of a riparian system.

Riparian zone (ecosystem). The interface between aquatic and terrestrial ecosystems that is defined by the presence of vegetation that requires or tolerates free or unbound water in the soil or substrate in which it is rooted. The term is treated rather broadly in this classification and includes transitional (xero-riparian) ecosystems.

Riverine system. Any wetland and deepwater habitat contained within a channel, with the exception of wetlands dominated by trees, shrubs, persistent emergents, and emergent mosses or lichens (Cowardin *et al.* 1979).

Root crown. The persistent base of a plant.

Saline. Soil or water containing sufficient soluble salts to interfere with the growth of plants.

Sand. Composed predominantly of coarse-grained mineral sediments with diameters larger than 0.003 inches (0.074 mm) and smaller than 0.08 inches (2 mm) in diameter.

Saturated. A soil condition in which all voids (pore spaces) between soil particles are filled with water.

Scarce. When relating to plant coverage in the association descriptions, any species that is very scattered, represented by a few individuals, or has canopy coverage of less than one (1) percent.

Seasonally flooded. Surface water is present for extended periods especially early in the growing season, but is absent by the end of the season in most years. When surface water is absent, the water table is often near the land surface (see also: semi-permanently flooded.)

Sediment. Solid material, both mineral and organic, that is in suspension, is being transported or has been moved from its site of origin by water, and has come to rest on the Earth's surface.

Sediment trapping. The process by which particulate matter is deposited and retained (by any mechanism or process) within a wetland.

Seep. Groundwater discharge areas where the water table comes close to the soil surface. In general, seeps have less flow than a spring and may not result in water forming an unconfined flow.

Semi-permanently flooded. Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land surface.

Seral. Refers to species or communities that have not theoretically attained a steady state with the environment, and current populations of some species are being replaced by other species.

Series. Refers to a group of plant associations having the same climax species characterizing the dominant plant cover. Thus the willow series is characterized by all plant associations dominated by species of willows and the Pacific silver fir series is composed of all types potentially dominated by Pacific silver fir at climax.

Shore (streambank). Land on or near an ocean, lake, river, or stream between the ordinary high water mark and low water mark.

Shoreline (streambank) anchoring. The stabilization of soil at the water's edge, or in shallow water, by fibrous plant roots and may include long-term buildup of riparian soil.

Shrub. A woody plant which at maturity is usually less than 20 feet (6 meters) tall and generally exhibits several erect, spreading, or prostrate stems and has a bushy appearance; e.g., mountain alder *(Alnus incan*a) or Geyer willow *(Salix geyeriana*). This term is used somewhat loosely in this classification as some shrubs, such as mountain alder, variably meet the definition of shrub or tree depending on site. Therefore, some users may interpret some plants indicated as "shrubs" in this classification as trees.

Silt. Rock fragments between 0.0008 inches (0.02 mm) and 0.00008 inches (0.002 mm) in diameter; as a textural class, a mixture of 20-50% sand, 30-80% silt, and l0-30% clay-sized particles.

Site index. An index of timberland productivity based on the height of specific trees at 50 or 100 years (formulas for specific tree species are given in references).

Sphagnum bog. A palustrine wetland with a mineral-poor substrate composed primarily of *Sphagnum* spp., with an acidic pH of less than 5.5.

Spring. A groundwater discharge area that has more flow than seeps and often produces a channel or pool below the source.

Stable. The condition of little or no perceived change in plant communities that are in relative equilibrium with existing environmental conditions; describes persistent but not necessarily culminating stages (climax) in plant succession.

Stand. An existing plant community that is relatively uniform in composition, structural, and site conditions; thus it may serve as a local example of a community type or association.

Stockpond. An artificial (dammed) body of water of less than 8 ha (20 acres) covered by surface water.

Stone. Rock fragments larger than 25.4 cm (10 inches) but less than 60.9 cm (24 inches).

Stream. A natural waterway that is defined as first to third order.

Streambank. see Bank.

Stream order. A classification of streams according to the number of the tributaries. Order l streams have no tributaries; a stream of any higher order has 2 or more tributaries of the next lower order.

Subalpine. The elevation region, identifiable by characteristic vegetation, between the midmontane and alpine zones. The boundaries between these zones vary considerably from one geographical region to another and with micro-climatic conditions.

Succession. The progressive changes in plant communities toward a steady state. Primary succession begins on a bare surface not previously occupied by plants, such as a recently deposited gravel bar. Secondary succession occurs following disturbances on sites that previously supported vegetation.

Swale. A depression or topographic low area.

Sward (turf). An expanse of grass or grass-like plants (fens, bogs, meadows).

Swamp. Vegetation dominated by trees, with the water table at or above the surface most of the year and with little or no accumulation of peat. Often intergrades with bog, fen, or carr.

Taproot. The primary root continuing the axis of the plant downward. Such roots can be thick or thin.

Terrace. A step-like surface, bordering a valley floor or shoreline that represents the former position of an alluvial floodplain or lake. In this classification it refers to the often multiple terraces beyond the 1 to 3 year floodplain (see alluvial terrace).

Toeslope. The geomorphic component that forms the outermost gently inclined surface at the base of a hill slope.

Topography. The relative positions and elevations of the natural or manmade features of an area that describe the configuration of its surface.

Transition zone (ecosystem). The interface between the riparian or wetland and adjacent terrestrial ecosystems that is identified by conditions that are more moist than normal. Soils are briefly saturated only in the spring, if at all, although soil moisture relationships are excellent due to the proximity to riparian or wetland sites. Also referred to as xeroriparian.

Tree. A woody plant that at maturity is usually 20 feet (6 meters) or more in height and generally has a single trunk unbranched to about three feet (l meter) above the ground, and a more or less definite crown.

Upland. Land at a higher elevation, in general, than the alluvial plain or low stream terrace.

Valley. An elongate, relatively large, externally drained depression of the earth's surface that is primarily developed by stream erosion.

Very long duration flooding. A duration class in which inundation for a single event is greater than 1 month.

Very poorly drained. Water is removed so slowly that free water remains at or near the soil surface during most of the growing season.

Volcanic. Pertaining to the structures, rocks, and landforms produced by volcanic action.

Water path. Used in the description of bogs and fens such as the Few-flowered Spike-rush (ELPA2) Association to indicate shallow, wide depressions in which water collects and flows during periods of high water. Water paths are not streambeds.

Water regime (Nontidal). Includes the following types (Cowardin and others 1979):

Permanently flooded – Water covers the land surface throughout the year in all years. Vegetation is composed of hydrophytes.

Intermittently exposed – Surface water is present throughout the year except in years of extreme drought.

Semi-permanently flooded – Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the soil surface.

Seasonally flooded – Surface water is present for extended periods especially early in the growing season, but is absent by the end of the growing season in most years. When surface water is absent, the water table is usually at or very near the soil surface.

Saturated - The substrate is saturated to the surface for extended periods of time during the growing season, but surface water is seldom present.

Temporarily flooded – Surface water is present for brief periods during the growing season, but the water table usually lies well below the soil surface for most of the season.

Intermittently flooded – The substrate is usually exposed, but the surface water is present for variable periods without the detectable seasonal periodicity. Weeks, months, even years may intervene between periods of inundation. Plant communities may change as soil moisture changes.

Water table. The depth below which the ground is saturated with water. The depth to standing water.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents with essentially no transport of the altered material. These changes result in disintegration and decomposition of the material.

Well represented. When relating to plant coverage, any species having a canopy coverage of greater than 5 percent.

Wetland. An area having one or more of the following three attributes: (1) at least periodically the substrate is dominated by facultative or obligate hydrophytes; (2) the substrate is predominantly hydric soil; (3) the substrate is nonsoil and is either saturated with or covered by shallow water at some time during the growing season.

Wetland hydrology. The saturation to the surface or inundation by water of a site as specified below (Federal Interagency Committee for Wetland Delineation 1989):

1. Saturation to the surface normally occurs when soils in the following natural drainage classes meet the following conditions:
   a. In somewhat poorly drained mineral soils, the water table is less than 15 cm (0.5 ft) from the surface for usually one week or more during the growing season, or
   b. In low permeability (<15 cm/hr [6 in]), poorly drained or very poorly drained mineral soils, the water table is less than 46 cm (1.5 ft) from the surface for usually one week or more during the growing season, or
   c. In more permeable ?15 cm/hr [6 in]), poorly drained or very poorly drained mineral soils, the water table is less than 30 cm (1 ft) from the surface for usually one week or more during the growing season, or
   d. In poorly drained or very poorly drained organic soils, the water table is usually at a depth where saturation to the surface occurs more than rarely. (Note: organic soils that are cropped are often drained, yet the water table is closely managed to minimize oxidation of organic matter. These soils often retain their hydric characteristics and if so, meet the wetland hydrology criterion.)

2. An area is inundated at some time if ponded or frequently flooded with surface water for one week or more during the growing season.

Wet meadow. A herbaceous wetland on mineral soil. Generally, wet meadows occur in seasonally flooded basins and flats, and are especially prominent on the margins (transition zone) of wetlands with organic soil.

Wetland/riparian species. Plant species occurring within the wetland/riparian zone.

Obligate species require the environmental conditions within the wetland zone.

Facultive species tolerate the environmental conditions but may also occur away from the wetland zone.

Wetland status. Refers to plant species that have exhibited an ability to develop to maturity and reproduce in an environment where all or portions of the soil within the root zone become, periodically or continually, saturated or inundated during the growing season. The ability to grow and reproduce in wetlands is due to morphological and/or physiological adaptations and/or reproductive strategies of the plant. These adaptations lead to the development of wetland communities that can be categorized as follows : O*bligate wetland* (OBL). Plant species that occur almost always (estimated probability greater than 99 percent) under natural conditions in wetlands.

Facultative wetland (FACW). Refers to a wetland community which supports plant species that usually occur in wetlands (estimated probability 67-99 percent), but are occasionally found in nonwetlands (estimated probability 1-33 percent).

Facultative (FAC). Refers to a wetland community which supports plant species that are equally likely to occur in wetlands or nonwetlands (estimated probability 1-33 percent).

Facultative upland (FACU). Refers to a wetland community which supports plant species that usually occur in nonwetlands (estimated probability 67-99 percent), but are occasionally found in wetlands (estimated probability 1-33 percent).

Valley gradient. The lengthwise slope of the valley floor in percent. The following classes are used in this classification:

Very low: 0-1 percent
Low: 1-3.44 percent
Moderate: 3.45-5.44 percent.
Steep: 5.45-8 percent
Very steep: >8 percent

Valley width. The width of the valley floor in meters (feet). The following classes are used in this classification:

Very broad: > 300 m (985 ft)
Broad: 100-300 m (328-985 ft)
Moderate: 30-100 m (99-328 ft)
Narrow: 10-30 m (33-99 ft)
Very narrow: < 10 m (33 ft)