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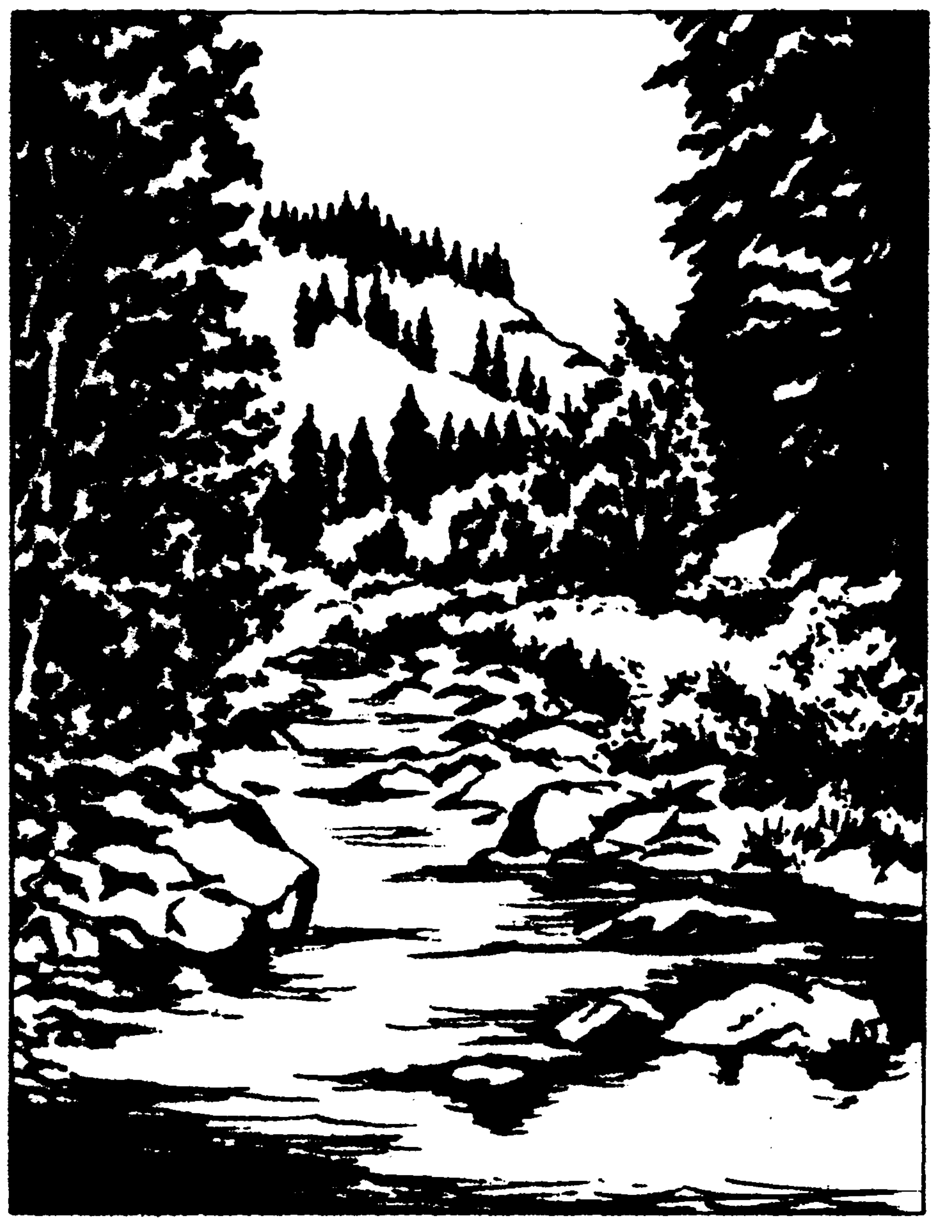
Mid-Montane Wetland Plant Associations of the Malheur, Umatilla and Wallowa-Whitman National Forests

By Elizabeth A. Crowe and Rodrick R. Clausnitzer



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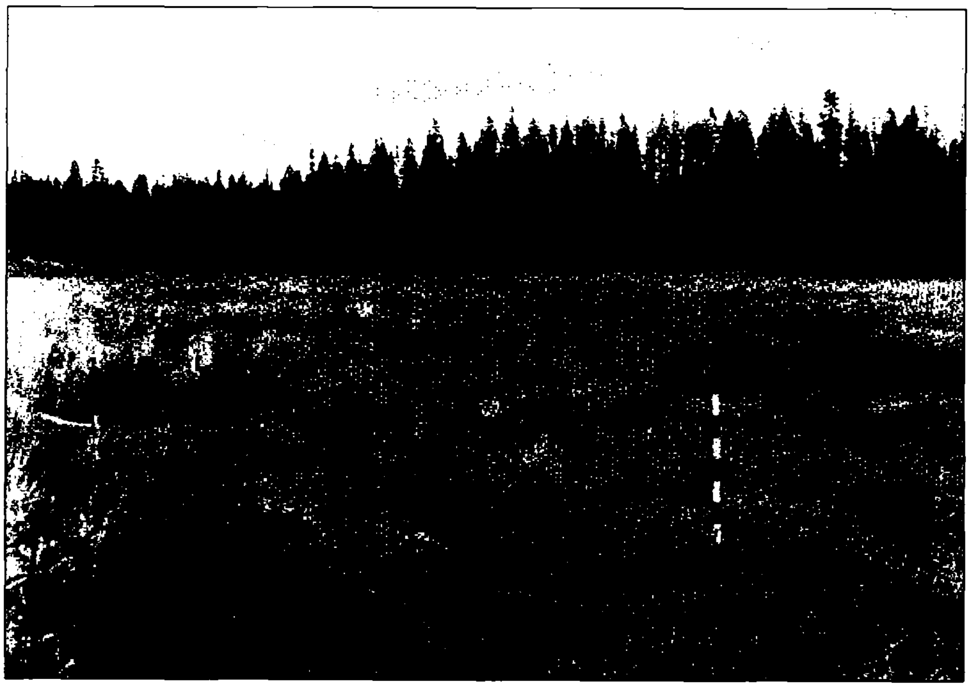

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Cover illustration by Anjelica Johnson. All other illustrations by Elizabeth Crowe.

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(NF=National Forest; RD=Ranger District; MNF=Malheur NF, BRD=Burns RD, PCRD=Prairie City RD, BVRD=Bear Valley RD, LCRD=Long Creek RD; UNF=Umatilla NF; HRD=Heppner RD, NFJDRD=North Fork John Day RD, WWRD=Walla Walla RD, PomRD=Pomeroy RD; WWNF=Wallowa-Whitman NF, WWRD=Wallowa Valley RD, HCNRA=Hell's Canyon Nat. Rec. Area, ECRD=Eagle Cap RD, LGRD=La Grande RD, BakRD=Baker RD, PRD=Pine RD, URD=Unity RD)

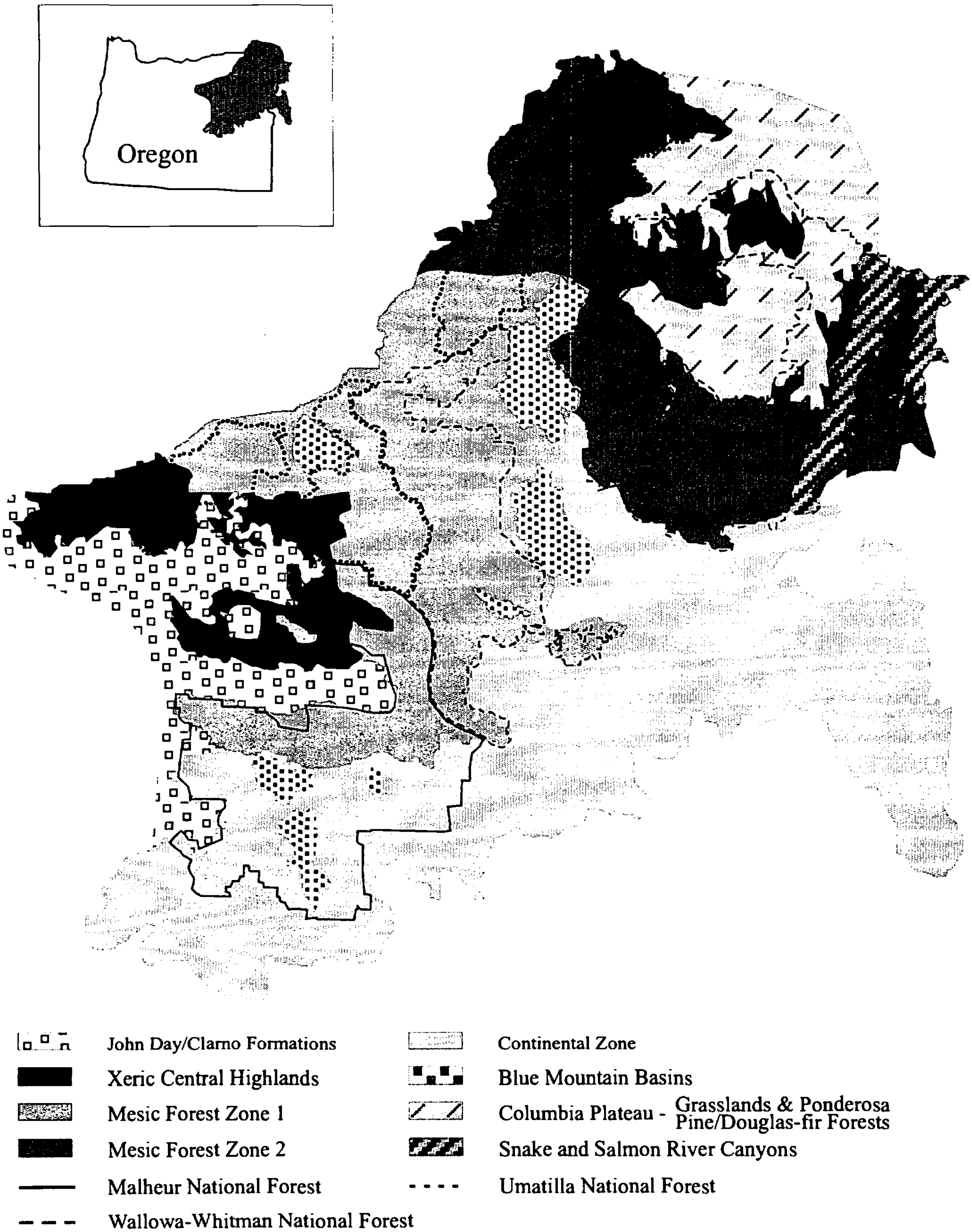


Figure 1. Ecological regions in the Blue Mountain Ecoregion (map simplified from Clarke and Bryce - Draft Subregions of the Blue Mountain Ecoregion)

INTRODUCTION

Wetlands are areas that are between terrestrial and aquatic systems and "that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that 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 and others 1979) uses the term, wetlands vegetation, to describe vegetation within or adjacent to, and hydrologically influenced by, streams, rivers, lakes, meadows and seeps. The term riparian vegetation is used specifically for vegetation located within the valley of, and hydrologically influenced by, a stream or river.

Wetlands are only a small portion of the Blue Mountains landscape. They are, however, disproportionately important habitat for plants and animals as a source of food, water, cover and nesting habitat. Vegetative productivity is generally higher in wetlands than in surrounding uplands and, in riparian areas, the cooler, moister microclimate provides a contrasting habitat to that of the uplands. Riparian areas are also of very high value for human uses including recreation, livestock grazing, water supply for municipalities, irrigation districts and local mining operations, crop production and transportation corridors. The structure and components of particular 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 amount, timing and erosive power are influenced by the soils, vegetation and geomorphology of fluvial surfaces within valley bottoms. The effects of decades of intensive use of riparian areas and other wetlands in the Blue Mountains Ecoregion has caused substantial degradation of their ecological structure, composition and function. Rehabilitation and restoration of wetland ecosystems is currently a high priority in the U.S. Forest Service and other public land management agencies. In order to improve conditions, an understanding of wetland ecosystems is necessary. Classification of plant associations provides a means of stratifying these ecosystems into recognizable and repeatable units. Wetland plant associations integrate potential natural vegetation, soil characteristics, fluvial geomorphology, hydrology and climate. This classification is integral to ecosystem management by providing a common framework for communicating about wetland ecosystems among various disciplines, and for planning management activities and analysis of their effects.

This guide presents a classification of wetland plant associations, community types and communities (described below) occurring within the Malheur, Umatilla and Wallowa-Whitman National Forests. Included are plant associations occurring on fluvial surfaces in valley bottoms that may not be classified as jurisdictional wetlands but that do function as "xeric" or "transitional" riparian areas (Kovalchik 1987). These fluvial surfaces are usually terraces or inactive floodplains. Jurisdictional wetlands must (under current regulations) have three components: wetland hydrology, hydric soils and hydrophytes. The Natural Resources Conservation Service has devised the list of soil types that qualify as hydric soils, the definitions of wetland hydrology are found wetland deliniation manual (Federal Interagency Committee for Wetland Delineation 1989) and the USFWS has prepared the list of hydrophytes and their degree of wetland affinity.

Plant community is a general term for an assemblage of plants living together and interacting among themselves in a specific location (R6 Glossary committee 1989). It has no assigned successional status. This term was used for naming single occurrences of a plant assemblage. The **plant community type** is a set of plant communities with similar structure and floristic composition (Pfister and others 1977). This term is used to denote repeated occurrences of plant communities that were not numerous enough to assign plant association status (i.e. fewer than 5 plots) or that are not climax community types (i.e. they are successional to another plant community). The **plant association** concept used in this classification refers to "an assemblage of native vegetation in equilibrium with the environment on a specific fluvial surface" (Kovalchik 1987). This means that as the environmental characteristics on a particular piece of ground changes the plant association potential will change. Thus, an alluvial bar with a Common horsetail plant association potential may lose 4 inches of gravel during a flood, be subsequently underwater for most of the year and thereby lose its Common horsetail potential. A stream adjacent to a floodplain with a Willow/Bladder sedge plant association may be downcut by five feet, thus lowering the water table in the adjacent floodplain and removing the surface from the average floodprone area. The floodplain has become a terrace and will lose the Willow/Bladder sedge plant association potential and be converted to a drier shrub or forested potential. For some plant associations, fewer than five plots were sampled. In these cases, association was assigned because the type is already described, and thus established, as an association in other classification.

The objectives of this guide are to provide information to allow users to be able to identify potential natural vegetation types in wetlands (and transitional riparian areas) and to provide information pertinent to the use and management of these areas. An attempt has been made to describe the successional status of classified vegetation types. The focus and timeframe of this project, however, were not sufficient to characterize the successional pathways and develop specific management and restoration recommendations for each association. Further work, focused specifically on these objectives, should be undertaken in order to provide the detailed information and guidelines required by land managers in the study area.

STUDY AREA

Area Covered

The study area encompasses National Forest lands on the Malheur, Umatilla and Wallowa-Whitman National Forests. The work focused on mid-montane lands where the most intensive management and the greatest disturbance of wetlands has occurred,. Excluded from this classification are lands within the Strawberry Mountains, North Fork John Day, Wenaha-Tucannon and Eagle Cap Wilderness Areas, as well as the unroaded areas in Hell's Canyon National Recreation Area and other deep canyons that occur on the three Forests. These areas will be classified during the next phase of wetlands classification in the study area. This classification complements (geographically) the upland vegetation classifications for the Blue and Ochoco Mountains (Johnson and Clausnitzer 1992) and the Wallowa-Snake Province (Johnson and Simon 1987). It also complements other riparian/wetland classifications that have been completed for National Forest lands across the western U.S.: for central Oregon (Kovalchik), eastern Washington (Kovalchik 1987), northwestern Oregon/southwestern Washington (Diaz and Mellon 1996), Nevada (Manning and Padgett 1996), Utah, eastern Idaho and western Wyoming (Padgett and other 1989, Youngblood and others 1985) and Montana (Hansen and others 1995).

Geology

The geology of the region is diverse with igneous rock dominant and sedimentary and metamorphic rocks locally important. During the Permian, Triassic and Jurassic (290-140 million years ago) a series of five major terranes accreted to the western North American shoreline (present-day western Idaho) to form the basement rocks of the Blue Mountains Region. These terranes comprise a variety of deep ocean floor mudstones and ophilites (gabbro, serpentine and basalt) and shallower ocean floor sedimentary rocks (limestone, sandstone and mudstones); conglomerates, extrusive volcanics and granitics. They were annealed (140-67 million years ago) through metamorphism, intrusion and volcanics activity. The Wallowa (granite) Batholith formed during this period. During the Cretaceous (67-55 million years ago) a vast, shallow seaway covered much of present-day Oregon including parts of the Blue Mountains.

The Cenozoic brought widespread extrusive igneous events. The Eocene (55-38 million years ago) was the period of formation of the vast Clarno andesitic and rhyolitic lavas interlayered with thick mud flows, colorful paleosols (old, buried soils) and tuffaceous sediments. The John Day Formation, comprised of deep ash-flow tuffs, rhyolites and andesitic lavas, followed during the Oligocene. These formations are found in western portions of the Malheur and Umatilla National Forests (Fig. 1). The Columbia River basalts which cover much of the northern Umatilla and Wallowa-Whitman National Forests and the Strawberry Volcano formed during the Miocene (25-5 million years ago). These flows were subsequently uplifted with folding and faulting of the ranges to form the axis of the Blue Mountains. Alpine glaciation during the Pleistocene (2 to 3 million years ago) created glacial landforms in the mountains and alluvial deposits in the valleys. Lake sediments of the central basin in Washington were the source of loessial deposits in the northern Blue Mountain Province. More recently volcanic ash has been deposited on the landscape by the eruption Mt. Mazama (6,000 years ago), which produced very thick deposits over wide areas and has had a tremendous influence on soil formation and properties (Baldwin 1964).

Climate

The climate of the Blue Mountain Region is an expression of both the temperate oceanic and temperate continental (cool summer phase) climates. The northern portion of the region is influenced by marine climatic conditions which result in a climate significantly different than the southern portion. Differences in precipitation, cloud cover, humidities and temperature fluctuations with respect to the temperate continental climate influence the occurrence and distribution of plant communities in the region. Greater precipitation, a higher percentage of cloudy days, higher relative humidities and less fluctuation in winter temperatures characterize the temperate oceanic climate in contrast to the temperate continental climate. Lower precipitation, fewer cloud days, lower relative humidities, rapid evapo-transpiration and wide temperature and precipitation fluctuations are characteristic of the latter climatic regime.

Physiographic Units

Recent efforts to provide a national framework for classifying, mapping and describing ecological units has resulted in a broad description of the region. The study area is included in Province M332 - Middle rocky Mountain Steppe, Coniferous Forest and alpine Meadow; Section M332G - Blue Mountains (McNab and Avers 1994). In a subsequent project, Section M332G has been described as the Blue Mountain Ecoregion and further subdivided into Subregions by Clarke and Bryce (In Press). These subregions (Fig. 1) were simplified and combined into units according to differences in wetland/riparian plant associations and are described below.

The **Continental Zone** (which combines Clarke and Bryce's Continental Zone Foothills and Highlands) comprises the southern Blue Mountains and is in the continental climate region of the western U.S, characterized by low precipitation, high evapotranspiration, abundant sunshine and high temperature extremes. Major river basins in this zone are the Silvies River (which drains internally into Malheur Lake), the Malheur River and the lower Powder and Burnt Rivers. The topography is undulating and gentler than in other zones in the Blue Mountains. Geologic formations are Pliocene-age rhyolites and ash-flow tuffs in the highlands and Miocene-age basalt and andesite lava flows and breccia. Upland vegetation is predominantly sagebrush, juniper, ponderosa pine and Douglas-fir plant associations with grand fir plant associations in steeper higher elevation areas. There are no true subalpine or alpine areas in the Continental Zone. Riparian vegetation in the middle and lower elevations of the Silvies and Malheur River drainage are dominated by sedge, willow/sedge, silver sagebrush and shrubby cinquefoil associations with mountain big sagebrush and ponderosa pine or Douglas-fir on terraces. Upper drainages generally have mountain alder and coniferous vegetation.

The **Blue Mountains Basins** are large depressional areas that: 1. are defined by downwarps in the flow sequences of flood basalt; 2. are erosional areas in soft substrates; or 3. have deep valley fills. These basins include Seneca Valley, SilviesValley, Ukiah Valley, Logan Prairie, Whitney Valley, Baker Valley, and Grande Ronde Valley. In the wetland areas these basins generally supported wet graminoid and willow-graminoid plant associations adjacent to highly sinuous, low gradient streams. On alluvial fans, and adjacent to steeper, higher energy streams, black cottonwood and coyote willow plant associations may be (or have been) more prevalent. Transitional riparian zones supported drier associations such as Douglas-fir/snowberry, ponderosa pine/snowberry or sagebrush plant associations.

The **John Day/Clarno Formations** are extensive volcanic deposits (described in the Geology section above). The **Xeric Central Highlands** are the higher elevations of the John Day/Clarno Formations. These highlands mark the vegetative change from the juniper and grassland savannah to ponderosa pine woodlands. Major river basins found within this zone are portions of the North and Middle Forks and mainstem John Day River. This zone has higher precipitation and smaller temperature extremes than the Continental Zone. Most upland soils have xeric moisture and frigid temperature regimes. There are no appreciable ash or loess deposits, so upland and steep headwater soils have low water holding capacities. Upland vegetation is primarily Douglas-fir, ponderosa pine and bunchgrass associations with some grand fir at higher elevations and in interior watersheds. Wetland and transitional riparian vegetation consists primarily of coniferous types and mountain alder association.

Mesic Forest Zone 1 comprises portions of Clarke and Bryce's Melange, Mesic forest and Maritime-Influenced zones. This areas is the heart of the Blue Mountains. Major river basins within this zone are the South and Middle Forks and mainstem of the John Day River, the upper Burnt River, the Powder River, the Grande Ronde River and the Umatilla River. The climate is transitional between the Maritime-influenced and Continental climates of the northern and southern Blue Mountains. The geology is a mix of Columbia River basalts, deep ocean floor rocks, granitics and volcanics. Mazama ash deposits have a great influence on upland and terrace soil water holding capacities, which in turn influence watershed hydrology and vegetative cover. Upland vegetation is dominated by coniferous vegetation, primarily grand fir, Engelmann spruce and subalpine fir, but also some Douglas-fir and ponderosa pine. Wetland vegetation that occurs in this zone consists of the black cottonwood (in broad, lower elevation valleys), mountain alder, currants, red-osier dogwood, black hawthorn and shrubby cinquefoil associations, all of the herbaceous types except short-beak sedge, and most of the grand fir, lodgepole pine, subalpine fir and Douglas-fir associations.

Mesic Forest Zone 2 encompasses the northern Blue Mountains and the Wallowa Mountains. The major drainages within this zone include the Umatilla River, the Walla Walla River, Mill Creek Watershed, the Touchet River, the Tucannon River, Asotin Creek, the middle and lower Grande Ronde River, and all of the tributaries of the Powder and Imnaha Rivers that drain from the Wallowas. The geology is dominated by Columbia River basalts in the north, which generally form plateaus and steep canyons. This topography is modulated in the north-facing drainages of the Touchet and Tucannon Rivers. The Wallowas have a complex geology of terrane rock sequences, granitics, volcanics and some Columbia River basalts. Although the major upland and wetland vegetation types are similar to those found in Mesic Forest Zone 1, the Maritime-influenced climate allows expression of additional moist grand fir associations such as grand fir/Rocky Mountain maple, grand fir/Pacific yew/queen's cup beadlily or twinflower and grand fir/False bugbane on toeslopes and in valley bottoms. Red alder types occur in the Umatilla River and Mill Creek Watershed on the Walla Walla RD. At higher elevations on higher gradient (A- and B-type) streams, Sitka alder associations replace mountain alder. Some of the glaciated (U-shaped) valleys in Wallowa Mountains contain streams with flashy runoff conditions and high sediment loads that cause braiding in the middle and lower reaches (e.g. Eagle Creek, Lake Fork, Catherine Creek). These conditions have allowed black cottonwood populations to establish at higher elevations than in other areas of the Blue Mountains area. The **Columbia Plateau** is a separate ecoregion that extends into the northern Blue Mountains on the Wallowa Valley and Pomeroy Ranger Districts and Hell's Canyon National Recreation Area. It is characterized vegetatively by Idaho fescue-bluebunch-wheatgrass grasslands, rose and snowberry shrublands and ponderosa pine and Douglas-fir forested plant associations. Where the Columbia Plateau extends onto National Forest lands, it is grouped with the other subregions comprising Mesic Forest Zone 2 in the landform key.

GEOMORPHOLOGY, SOILS AND STREAM CLASSIFICATION

Understanding the geomorphology of wetlands settings, especially riparian areas, is integral to the interpretation of vegetative potential and for understanding the arrangement and extent of the complex of vegetation types found in a valley or basin. Within physiographic units are valley types, defined by the shape, gradient, width, side slope gradient and aspect. Within stream valleys are fluvial surfaces with particular soil and hydrological characteristics (soil texture, soil moisture, flooding regime, etc.) that influence and (are influenced by) the development of particular plant associations. Fluvial surfaces identified in this study are: alluvial bars, streambanks, floodplains, overflow channels and terraces. In other wetland settings the geomorphic surfaces are less well-defined and gradients of soil and hydrological features are associated with vegetative communities.

Fluvial surfaces are formed by water and sediment movement by streams. Alluvial bars and streambanks are underwater during high runoff periods every one to two years on the average. Overflow channels and floodplains receive surface flow when runoff is higher than the channel capacity. Terraces are surfaces that are raised above the floodprone area due to 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 floodprone surfaces. Gentle flows over floodplains will carry small particle sizes. Higher energy, "flashy" flows will carry larger particle sizes.

Flood erosion and deposition by streams and surface and subsurface water flow in other wetlands influences soil formation. Soil features found to be most important in characterizing wetland plant associations in this classification are: texture (amount of sand, silt and clay particles), organic matter content, coarse fragment content, and depth to water table. The soil orders found most often in the sampled wetlands and transitional riparian areas were Entisols, Histosols, Mollisols and Inceptisols.

The Forest Service has adopted the Rosgen stream classification system to provide all disciplines with a standard method for describing and communication about stream morphologies, how they fit in the landscape and how various management actions will affect them. Stream reaches adjacent to sampled plant communities were classified to establish correlations between stream types, the fluvial surfaces associated with those reaches and the plant communities associated with those surfaces. For detailed information on the Rosgen stream classification, fluvial geomorphology and the influence of vegetation on specific stream types and vice versa, users are referred to Applied River Morphology (Rosgen 1996).

Briefly, streams classified into these most common types:

A - steep, highly entrenched, step pool systems with high sediment transport potential. Riparian vegetation usually occurs only on the stream banks.

B - gentle to moderately steep terrain, moderate gradient streams that are moderately entrenched, have low sinuosity and are riffle-dominated. Riparian vegetation occurs on streambanks, on adjacent high floodplains or terraces if present and occasionally on alluvial bars that are parallel to the stream. (Similar to Montgomery and Buffington's [1993] plane-bed channel)

C - low gradient, moderately high sinuosity, pool/riffle bedform with well-developed floodplains. Riparian vegetation usually occurs on alluvial point bars, on floodplains, on stream banks opposite cutbanks and on terraces.

D - braided with moderate channel slope. Riparian vegetation occurs on floodplains, terraces and midstream alluvial bars.

E - very low gradient, highly sinuous, with low width to depth ratios. Riparian vegetation occurs on floodplains and occasionally banks when an erosional or depositional event has occurred.

F - highly entrenched, high width to depth ratio streams. Riparian vegetation is present on incipient floodplain forming within the cutbanks of this stream type. The associated fluvial surface is now a terrace and usually has some dry riparian or upland plant association.

FIELD METHODS

Sites were sampled by field reconnaissance in the summers of 1989 and 1992-1995. Late seral wetland and transitional riparian communities were sampled whenever possible. In areas of consistently high levels of disturbance, some mid-seral communities were sampled. Where possible, reconnaissance of the drainage was made prior to plot selection.

Sites were permanently marked with steel angle-iron stakes, and location signs with directions to the plot(s) were nailed to nearby (easily visible) bearing trees. Sites are marked on aerial photos and 7.5" U.S.G.S. quadrangles and have been digitized on the GIS permanent monitoring point layer. The data corresponding to these points has not yet been linked to the GIS layer. Location information (Forest, District, township, range and section) and elevation were recorded. Cross-sectional and plan-view sketches were made showing the location of fluvial surfaces and both wetland/transitional riparian and adjacent upland plant associations at the wetland sampling site. Each fluvial surface with its corresponding plant association represented a potential plot. One to several plots were sampled at each site. Plot sizes were 5 x 10 m in herbaceous and shrubby vegetation and a 375 square meter circle in forested vegetation . Plots were placed so as to sample representative vegetation for each association and to avoid ecotones.

Valley landform descriptors (valley shape, gradient, width, side slope gradient and aspect) were recorded for each site. Aspect, slope, microtopography and fluvial surface were recorded for each plot. Permanent camera points were established and black and white prints and color slides of each plot were taken. Canopy coverages for all vascular plants were recorded for each plot. Cover was estimated to the nearest percent up to 10% and to the nearest 5% thereafter. Ground cover are by surface features (submergence, bare ground, gravel, rock, bedrock, moss, lichen, liverwort and litter) were recorded using the same method. Plants not identified in the field were collected for later identification.

Soils were sampled either with a 3-inch diameter auger or by digging a pit with a tile spade. Field descriptions of morphological features included: current depth of the water table; depth to which 90% of the vascular plant roots reach; depth to and description of redoximorphic features (formerly known as mottling and gleying); depth of the surface organic horizon (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 coloring of redoximorphic concentrations and depletions; texture; current moisture status (dry, moist, wet or saturated); percentage and size class of coarse fragments, if present; and amount and diameter classes of roots.

The Rosgen stream type was determined for the stream reach (where present) adjacent to the sample site and information was recorded on the bankfull width/depth ratio; entrenchment; stream width class; gradient; sinuosity; flow regime; percentage of pools, glides and riffles; apparent aggradation, degradation or stability of the channel; and percentage class of the active channel affected by large and/or small woody debris.

Basal area tallies of tree species, if present, were taken as well as measurements of site index trees. A tally of snags (using a basal area factor of 10) included information on the diameter at breast height, height, condition class (Thomas

1979) and evidence of cavities, feeding and/or nesting. A 30 ft. x 8 ft. downed log transect was sampled inside the plot. Information on species, diameter, size class, condition class (Thomas 1979) and length was recorded. Three samples of herbaceous species were collected by clipping plants just above the litter layer in a 0.9 sq. ft. circle. The plant material was dried and weighed to determine production (lbs./acre) of herbaceous matter. Shrub and herb layer heights were recorded.

General observations of fire, insects and disease, livestock and wild ungulate foraging, and logging, mining and road impacts on the sample site were recorded. Also recorded were sightings of birds, small mammal and fish and evidence of their habitation or feeding.

OFFICE METHODS

Data were entered into a relational database developed using Paradox 3.5 (Borland International 1990). Data management and production of association and synthesis tables were accomplished using Paradox and EcoAID (Smith, undated), a software program for ecological data analysis. Through EcoAID data were also transformed for use in the statistical analyses mentioned below.

Ordination and classification programs, DECORANA and TWINSPAN (Hill 1979) were used to develop concepts of classification group membership, species ecological amplitudes and temperature and moisture gradients encountered within a series or lifeform group (e.g. herbaceous plots). This preliminary classification was based on floristic variables. 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 produces.

Groups were then subjected to a multivariate procedure called discriminant analysis (SAS 1988). During this phase of analyses, environmental and soil variables and floristic attributes were statistically screened for the most "characteristic" to use in the classification. Environmental variables used were valley gradient, valley width, valley aspect, elevation, plot slope, plot aspect, soil surface feature coverages and microtopography. Soil variables used were depth to current water table, depth to moist, wet and/or saturated soil, thickness of surface organic layer(s), thickness of epipedon, depth to buried stream bed, and depth to classes of course fragment content (10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%). Then group membership hypotheses were tested and memberships adjusted. Results of discriminant analysis were used to build final association groups. Association tables and statistical summaries for these groups are displayed in the individual plant association descriptions and in the appendices.

Soil profile data are summarized in tables within individual major plant association descriptions. For shrubby and herbaceous types soils were classified using the morphological data collected. Soils were classified as specifically as possible to: order, suborder, great group or subgroup. Most soils were classified to the great group level. Upland plant associations on adjacent toeslopes and/or sideslopes are given in all plant association descriptions. Snag data are summarized in Appendix E. Downed log data are summarized in Appendix F.

A complete list of all species encountered during field sampling is given in Appendix B. Entries give the US Forest Service Region 6 alpha code, the newer national PLANTS database alpha code, the scientific name and the common name(s). Scientific names follow Hitchcock and Cronquist (1973) with the following exceptions: *Carex utriculata* (Bladder sedge) (Mastrogiuseppe 1993) for *Carex rostrata* (Beaked sedge); and *Salix boothii* (Booth willow) (Brunsfeld and others 1985) for *Salix myrtillifolia* (Blueberry willow).

CONTENTS AND USE OF THE GUIDE

The classification contains: a vegetative key; a landform key; descriptions of plant associations, plant community types and plant communities; and appendices containing a glossary, information about individual wetland/riparian species, information about snags and downed logs within vegetative types and summary tables of canopy coverage and constancy values of species within vegetative types. A crosswalk between the Region 6 species alphacodes (consisting of the first two letters of the genus and species, e.g. *Pinus ponderosa* = PIPO) and the newly adopted national PLANTS database alphacodes is found within Appendix B. This guide used the Region 6 codes. Appendix D provides information on individual species to use for evaluating wetland status, for determining restoration capabilities and site potentials and for determining possible disturbance agents.

How to Determine a Plant Association, Community Type or Community

Select a relatively homogenous area with regard to vegetation, fluvial surface (alluvial bar, floodplain, terrace, overflow channel, seep or spring), substrate (coarse of fine-textured, organic or mineral, etc.) and seasonal hydrology (if known). For herbaceous and shrubby sites the area should be a 5 x 10 m rectangle and for forested types a 11 m radius circle (375 sq. meters total area). Small or irregularly-shaped stands may need smaller or irregularly-shaped plots. Within this area, use the vegetative key (begins on p. 9) to determine the plant association, community type or community by estimating canopy cover of key indicator species present within the plot. Once a tentative identification has been made, find the description and compare the characteristics of the site with the written descriptions of the type (and appendix material if needed). If the site does not match the description, try the key again. **The key is not the classification**; it only a shortcut to identification. **It is essential that the user read the description**. The classification is based primarily on relatively undisturbed sites. If the site is highly disturbed or the vegetative key does not seem to lead to a definite type, try the landform key (begins on p. 21), which may help to narrow down the possibilities.

Plant Association Descriptions

Nomenclature: The plant associations, plant community types and plant communities have been grouped into "series" based upon the projected climax species which dominates the uppermost canopy layer. For example, the grand fir series includes plant communities in which grand fir is projected as the climax tree species. Plant associations are named using the climax dominant species followed by a slash (/) and the listing of the characteristic or indicator species of a subordinate layer or layers (e.g. subalpine fir/bog blueberry/Holm's sedge). A dash (-) is used to separate names or codes of the same layer (e.g. mountain alder-currants).

Sample Size: The number of plots used to describe the plant associations, plant community types and plant communities are provided as follows (n=8).

Physical Environment: A brief description of the location of sampled plots, landforms, fluvial surfaces, soil attributes and classification, Rosgen stream reach types adjacent to plots, and stream characteristics.

Cross Sectional Sketch(s): These sketches show a typical valley landform cross section containing the stream (if present), fluvial surfaces and wetland and upland plant associations. Plant figures used in sketches shown in Fig. 2.

Valley Environment and Soil Surface Cover Tables: Displayed here are valley and plot variables and soil surface coverages.

Soil Profile Characteristics: Compilations of information about soil layers described within sampled plots. These characteristics are often highly variable, but are provided to give the reader a general idea of soil properties that are correlated with particular plant associations.

Table of Principal Species: This table contains only the primary species of a plant association or plant community type. Constancy refers to the percentage of frequency of occurrence by a species in the total number of plots used for describing the type. Mean coverage was calculated by dividing the total canopy cover of a species in all plots in which it occurred by the number of plots containing that species.

Vegetation Composition: A brief description of the principal species comprising the type and the upland plant associations adjacent to sites sampled.

Management Considerations: Responses of the vegetation to modifications by silvicultural treatment, to use by livestock and wild animals and to the effects of fire. <u>Stand Characteristics</u> - Basal area (square feet/acre) and site index are presented for major tree species of forested plant associations. Site index equations were derived from the USDA Forest Service Stand Exam Manual (1987). These include: subalpine fir (100 yr. base age) from Herman (1978); Engelmann spruce (50 yr. base age) from Brickell (1970); lodgepole pine (90 year base age) from Dahms (1975); grand fir (100 yr. base age) from Cochran (1979); western larch (50 yr. base age) from Cochran (1985); Douglas-fir (50 yr. base age) from Cochran (1979); ponderosa pine (100 yr. base age) from Barrett (1978); and red alder (20 yr. base age) from Harrington (1985).

USDI Fish and Wildlife Wetland Classification: A description of the wetland habitat for the plant association or plant community type. It follows the system outlined by Cowardin and others (1979).

Other Studies: A listing of authors and studies with similarly described vegetation.

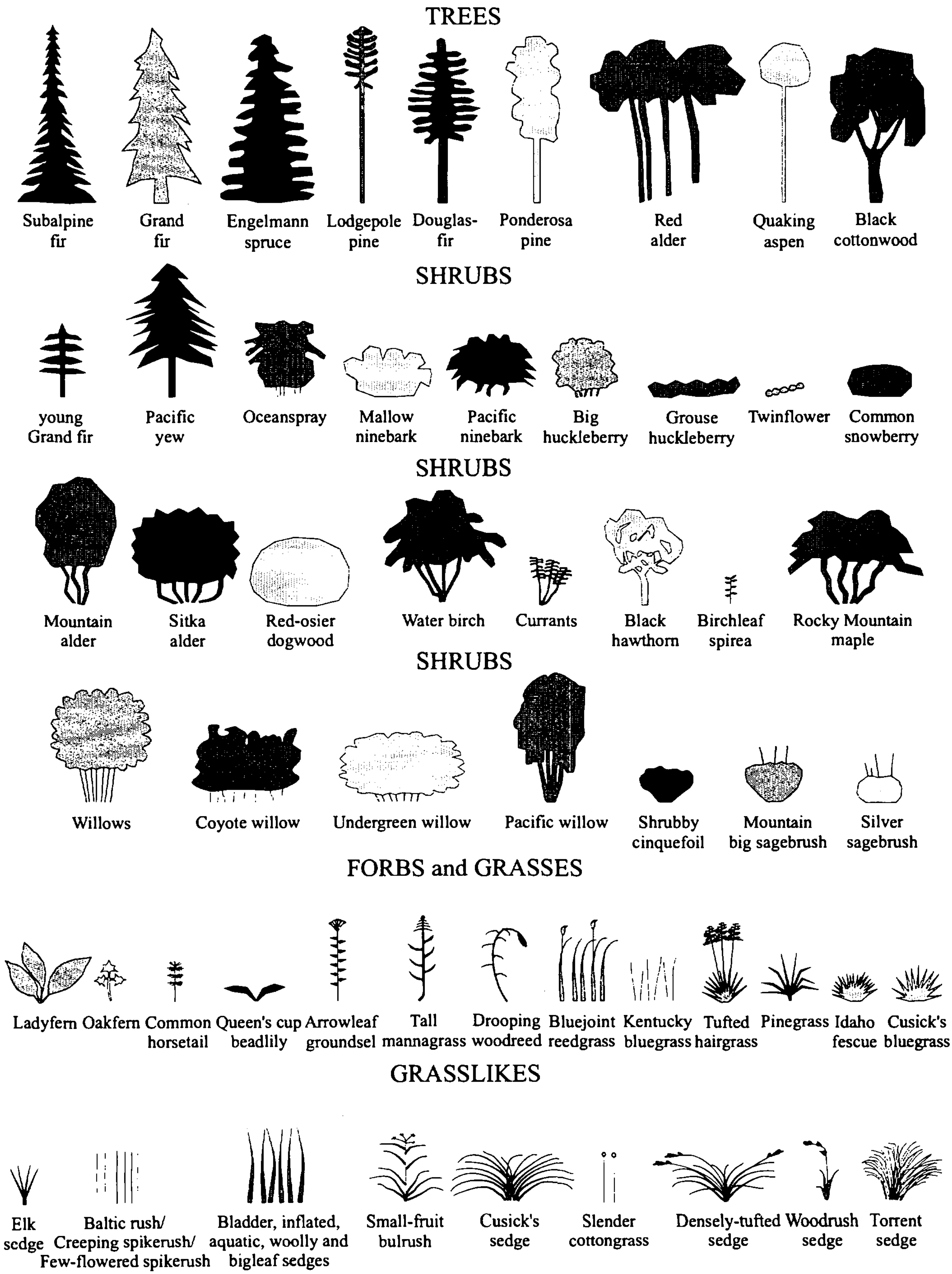


***Figure 2.** Plant figures used in cross-sectional drawings found in plant association descriptions.*

KEY TO MAJOR VEGETATIVE LIFEFORMS

1a. Trees ≥ 25% cover .... see Key to Forested Plant Associations, Plant Community Types and Plant Communities .... (p. 10)

1b. Trees cover < 25 2

2a. Shrubs ≥ 25% cover .... see Key to Shrubby Plant Associations, Plant Community Types and Plant Communities .... (p. 14)

2b. Shrubs < 25% cover .... see Key to Herbaceous Plant Associations, Plant Community Types and Plant Communities .... (p. 18)

If a coniferous forest community does not key out in the Forested Types key, try the upland guides, Plant Associations of the Blue and Ochoco Mountains (Johnson and Clausnitzer 1992) or Plant Associations of the Wallowa-Snake Province (Johnson and Simon 1987). If the community is an early or mid-seral grand fir community that does not key out in the Forested Types key, try The Grand Fir Series of Northeastern Oregon and Southeastern Washington: Successional Stages and Management Guide (Clausnitzer 1993).

Note: Although 10% tree cover is commonly used to distinguish forested from shrubby and herbaceous vegetation types, the 25% cover break is more appropriate for the types described in this guide based on the data analysis.

Key to Forested Plant Associations, Plant Community Types and Plant Communities

1a. Subalpine fir present and reproducing with cover ≥ 5% 2

2a. Lady fern cover ≥ 5% .... **Subalpine Fir/Lady Fern Plant Association** (p. 34)
2b. Lady fern cover < 5% 3

3a. Arrow-leaf groundsel cover ≥ 5% .... **Subalpine Fir/Arrow-leaf Groundsel Plant Association** (p. 36)
3b. Arrow-leaf groundsel cover < 5% 4

4a. Aquatic sedge cover ≥ 25% or the dominant herbaceous species
.... **Subalpine Fir/Aquatic Sedge Plant Community Type** (p. 38)
4b. Aquatic sedge cover < 25% 5

5a. Bluejoint reedgrass cover ≥ 25% or the dominant herbaceous species
.... **Subalpine Fir/Bluejoint Reedgrass Plant Community Type** (p. 38)
5b. Bluejoint reedgrass cover < 25% 6

6a. Soft-leaved sedge cover ≥ 25% or the dominant herbaceous species
.... **Subalpine Fir/Soft-leaved Sedge Plant Community Type** (p. 38)
6b. Soft-leaved sedge cover < 25% 7

7a. Holm's sedge cover ≥ 25% or the dominant herbaceous species
.... **Subalpine Fir/Bog Blueberry/Holm's Sedge Plant Community Type** (p. 39)
7b. Holm's sedge cover < 25% .... Depauperate or undefined type or not Subalpine Fir series

1b. Subalpine fir cover < 5% 8

8a. Engelmann spruce present and reproducing with cover ≥ 5% 9

9a. Lady fern cover ≥ 5% .... **Engelmann Spruce/Lady Fern Plant CommunityType** (p. 42)
9b. Lady fern cover < 5% 10

10a. Arrow-leaf groundsel cover ≥ 5%
.... **Engelmann Spruce/Arrow-leaf Groundsel Plant Community Type** (p. 44)
10b. Arrow-leaf groundsel cover < 5% 11

11a. Common horsetail cover ≥ 5% .... **Engelmann Spruce/Common Horsetail Plant Association** (p. 46)
11b. Common horsetail cover < 5% 12

12a. Soft-leaved sedge cover ≥ 25% .... **Engelmann Spruce/Soft-leaved Sedge Plant Association** (p. 46)
12b. Soft-leaved sedge cover < 25% 13

13a. Red-osier dogwood cover ≥ 25% or the dominant shrub
.... **Engelmann Spruce/Red-osier DogwoodPlant Association** (p. 46)
13b. Red-osier dogwood cover < 25% 14

14a. Columbia brome cover ≥ 5% ..... **Engelmann Spruce/Columbia Brome Plant Community Type** (p. 47)
14b. Columbia brome cover < 5% 15

15a. Drooping woodreed cover ≥ 25% .... **Engelmann Spruce/Drooping Woodreed Plant Community** (p. 47)
15b. Drooping woodreed cover < 25%
.... Depauperate or undefined type or not Engelmann Spruce series

8b. Engelmann spruce cover < 5% 16

16a. Lodgepole pine present and reproducing with cover ≥ 5% 17

17a. Aquatic sedge cover ≥ 25% or the dominant herbaceous species
. . . . **Lodgepole Pine/Aquatic Sedge Plant Association** (p. 50)

17b. Aquatic sedge cover < 25% 18

18a. Tufted hairgrass cover ≥ 25% or the dominant herbaceous species
. . . . **Lodgepole Pine/Tufted Hairgrass Plant Association** (p. 50)

18b. Tufted hairgrass cover < 25% 19

19a. Woolly sedge cover ≥ 25% or the dominant herbaceous species
. . . . **Lodgepole Pine/Woolly Sedge Plant Community** (p. 51)

19b. Woolly sedge cover < 25% 20

20a. Mountain alder cover ≥ 25% or the dominant shrub
. . . . **Lodgepole Pine/Mountain Alder/Mesic Forb Plant Community** (p. 51)

20b. Mountain alder cover < 25% 21

21a. Bluejoint reedgrass cover ≥ 25% or the dominant herbaceous species
. . . . **Lodgepole Pine/Bluejoint Reedgrass Plant Community** (p. 51)

21b. Bluejoint reedgrass cover < 25% 22

22a. Kentucky bluegrass cover ≥ 25% or the dominant herbaceous species
. . . . **Lodgepole Pine/Kentucky Bluegrass Plant Community Type** (p. 51)

22b. Kentucky bluegrass cover < 25% . . . . Depauperate or undefined type or not Lodgepole pine series

16b. Lodgepole pine cover < 5% 23

23a. Grand fir present and reproducing with cover ≥ 5% 24

24a. Lady fern cover ≥ 5% . . . . **Grand Fir/Lady Fern Plant Association** (p. 54)

24b. Lady fern cover < 5% 25

25a. Oak fern cover ≥ 5% . . . . **Grand Fir/Oak Fern Plant Association** (p. 56)

25b. Oak fern cover < 5% 26

26a. Rocky Mountain maple and/or mallow ninebark cover ≥ 10%
. . . . **Grand Fir/Rocky Mountain Maple-Floodplain Plant Association** (p. 58)

26b. Rocky Mountain maple and/or mallow ninebark cover < 10% 27

27a. Common snowberry cover ≥ 25% or the dominant shrub
. . . . **Grand Fir/Common Snowberry-Floodplain Plant Community Type** (p. 60)

27b. Common snowberry cover < 25% 28

28a. Woolly sedge cover ≥ 25% or the dominant herbaceous species
. . . . **Grand Fir/Woolly Sedge Plant Community** (p. 60)

28b. Woolly sedge cover < 25% 29

29a. Tufted hairgrass cover ≥ 5% . . . . **Western White Pine/Tufted Hairgrass Plant Community** (p. 61)

29b. Tufted hairgrass cover < 5% . . . . Depauperate or undefined type or not Grand fir series

23b. Grand fir cover < 5% 30

30a. Douglas-fir present and reproducing with cover ≥ 5% 31

31a. False bugbane cover ≥ 5% .... **Douglas-fir/False Bugbane Plant Community Type** (p. 68)
31b. False bugbane cover < 5% 32

32a. Rocky Mountain maple and mallow ninebark total cover ≥ 10%
. **Douglas-fir/Rocky Mountain Maple-Mallow Ninebark-Floodplain Plant Association** (p. 64)
32b. Rocky Mountain maple and mallow ninebark total cover < 10% 33

33a. Common snowberry cover ≥ 5% . **Douglas-fir/Common Snowberry-Floodplain Plant Association** (p. 66)
33b. Common snowberry cover < 5% .... Depauperate or undefined type or not Douglas-fir series

30b. Douglas-fir cover < 5% 34

34a. Ponderosa pine present and reproducing with cover ≥ 5% 35

35a. Common snowberry cover ≥ 5% . **Ponderosa Pine/Common Snowberry-Floodplain Plant Association** (p. 72)
35b. Common snowberry cover < 5% 36

36a. Kentucky bluegrass cover ≥ 25% or the dominant herbaceous species
.... **Ponderosa Pine/Kentucky Bluegrass Plant Community Type** (p. 74)
36b. Kentucky bluegrass cover < 25%
.... Depauperate or undefined type or not Ponderosa pine series

34b. Ponderosa pine cover < 5% 37

37a. Quaking aspen present and reproducing with cover ≥ 5% 38

38a. Aquatic sedge cover ≥ 25% or the dominant herbaceous species
.... **Quaking Aspen/Aquatic Sedge Plant Community Type** (p. 84)
38b. Aquatic sedge cover < 25% 39

39a. Woolly sedge cover ≥ 25% or the dominant herbaceous species
.... **Quaking Aspen/Woolly Sedge Plant Association** (p. 78)
39b. Woolly sedge cover < 25% 40

40a. Bluejoint reedgrass cover ≥ 25% or the dominant herbaceous species
.... **Quaking Aspen/Bluejoint Reedgrass Plant Community Type** (p. 84)
40b. Bluejoint reedgrass cover < 25% 41

41a. Mountain alder cover ≥ 25% or the dominant shrub 42

42a. Red-osier dogwood cover ≥ 25%
.... **Quaking Aspen/Mountain Alder-Red-osier Dogwood Plant Community** (p. 84)
42b. Red-osier dogwood cover < 25% 43

43a. Common snowberry cover ≥ 25%
.... **Quaking Aspen/Mountain Alder-Common Snowberry Plant Community** (p. 84)
43b. Common snowberry cover < 25% 41b

41b. Mountain alder cover < 25% 44

44a. Common snowberry cover ≥ 5% .. **Quaking Aspen/Common Snowberry Plant Community Type** (p. 80)
44b. Common snowberry cover < 5% 45

45a. Kentucky bluegrass cover ≥ 25% or the dominant herbaceous species
.... **Quaking Aspen/Kentucky Bluegrass Plant Community Type** (p. 82)

45b. Kentucky bluegrass cover < 25% 46

46a. Mesic forbs dominant understory species, graminoids depauperate
.... **Quaking Aspen/Mesic Forb Plant Community Type** (p. 84)

46b. Mesic forbs scarce .... Depauperate or undefined type or not Quaking Aspen series

37b. Quaking aspen cover < 5% 47

47a. Black cottonwood present and reproducing with cover ≥ 5% 48

48a. Pacific willow and rigid willow cover ≥ 25% or the dominant shrubs
.... **Black Cottonwood/Pacific Willow Plant Association** (p. 88)

48b. Pacific willow and rigid willow cover < 25% 49

49a. Mountain alder and/or red-osier dogwood cover ≥ 25% or the dominant shrubs
...... **Black Cottonwood/Mountain Alder-Red-osier Dogwood Plant Association** (p. 90)

49b. Mountain alder and/or red-osier dogwood cover < 25% 50

50a. Rocky Mountain maple cover ≥ 25% or the dominant shrub
.... **Black Cottonwood/Rocky Mountain Maple Plant Community Type** (p. 92)

50b. Rocky Mountain maple cover < 25% 51

51a. Common snowberry cover ≥ 5% **Black Cottonwood/Common Snowberry Plant Community Type** (p. 94)

51b. Common snowberry cover < 5% .... Depauperate or undefined type or not Black Cottonwood series

47b. Black cottonwood cover < 5% 52

52a. Red alder present and reproducing with cover ≥ 5% 53

53a. Ladyfern cover ≥ 5% .... **Red Alder/Lady Fern Plant Community Type** (p. 100)

53b. Ladyfern cover < 5% 54

54a. Sweet coltsfoot cover ≥ 5% .... **Red Alder/Sweet Coltsfoot Plant Community Type** (p. 100)

54b. Sweet coltsfoot cover < 5% 55

55a. Creeping buttercup cover ≥ 1% on gravel or cobble bar
.... **Red Alder/Alluvial Bar Plant Community Type** (p. 100)

55b. Creeping buttercup absent or fluvial surface not a gravel or cobble bar 56

56a. Red-osier dogwood cover ≥ 25% or the dominant shrub
.... **Red Alder/Red-osier Dogwood Plant Community** (p. 100)

56b. Red-osier dogwood cover < 25% 57

57a. Pacific ninebark cover ≥ 25% or the dominant shrub
.... **Red Alder/Pacific Ninebark Plant Association** (p. 98)

57b. Pacific ninebark cover < 25% 58

58a. Common snowberry cover ≥ 25% or the dominant shrub
.... **Red Alder/Common Snowberry Plant Community Type** (p. 100)

58b. Common snowberry cover < 25% .... Depauperate or undefined type or not Red Alder series

52b. Red alder cover < 5% .... Undefined type or repeat forested key or try shrub or herbaceous keys

Key to Shrubby Plant Associations, Plant Community Types and Plant Communities

1a. Willow species cover ≥ 25% or the dominant shrub 2

2a. Undergreen willow cover ≥ 25% 3

3a. Holm's sedge cover ≥ 25% cover or the dominant graminoid .... **Undergreen Willow/Holm's Sedge Plant Association** (p.104)
3b. Holm's sedge cover < 25% 4

4a. Bladder sedge cover ≥ 25% .... **Undergreen Willow/Bladder Sedge Plant Community** (p. 116)
4b. Bladder sedge cover < 25% 5

5a. Clustered field sedge cover ≥ 25% .... **Undergreen Willow/Clustered Field Sedge Plant Community** (p. 116)
5b. Clustered field sedge cover < 25% .... Depauperate or undefined Undergreen willow type

2b. Undergreen willow cover < 25% 6

6a. Eastwood and Tweedy's willow cover ≥ 25% and Aquatic sedge cover ≥ 25% or the dominant graminoid .... **Eastwood Willow-Tweedy's Willow/Aquatic Sedge Plant Community** (p. 116)
6b. Eastwood and Tweedy's willow cover < 25% and Aquatic sedge absent 7

7a. Geyer willow, Booth willow, Bebb willow, Lemmon willow and/or Bog birch cover ≥ 25% 8

8a. Bladder sedge cover ≥ 25% or the dominant graminoid .... **Willow/Bladder Sedge Plant Association** (p. 106)
8b. Bladder sedge cover < 25% 9

9a. Aquatic sedge cover ≥ 25% or the dominant graminoid ...... **Willow/Aquatic Sedge Plant Association** (p. 108)
9b. Aquatic sedge cover < 25% 10

10a. Woolly sedge cover ≥ 25% or the dominant graminoid .... **Willow/Woolly Sedge Plant Association** (p. 110)
10b. Woolly sedge cover < 25% 11

11a. Kentucky bluegrass cover ≥ 25% or the dominant graminoid .... **Willow/Kentucky Bluegrass Plant Community Type** (p. 112)
11b. Kentucky bluegrass cover < 25% 12

12a. Bluejoint reedgrass cover ≥ 25% or the dominant graminoid .... **Willow/Bluejoint Reedgrass Plant Community** (p. 116)
12b. Bluejoint reedgrass cover < 25% 13

13a. Mesic forbs dominant understory species, graminoids depauperate .... **Willow/Mesic Forb Plant Community Type** (p. 116)
13b. Mesic forbs scarce ... Depauperate or undefined Geyer/Booth/Bebb/Lemmon/Rigid Willow/bog Birch community

7b. Geyer willow, Booth willow, Bebb willow, Lemmon willow, Rigid willow and/or Bog birch < 25% cover 14

14a. Coyote willow cover ≥ 25% .... **Coyote Willow Plant Association** (p. 114)
14b. Coyote willow < 25% 15

15a. Rigid willow cover ≥ 25% .... **Rigid Willow Plant Community Type** (p. 117)
15b. Rigid willow cover < 25% 16

16a. Scouler willow and blue wildrye cover ≥ 25% ...... **Scouler Willow/Blue Wildrye Plant Community** (p. 117)
16b. Scouler willow cover and/or blue wildrye cover < 25% 1b

1b. Willow species cover ≤ 25% 17

17a. Sitka alder ≥ 25% cover 18

18a. Ladyfern ≥ 5% cover .... **Sitka Alder/Ladyfern Plant Association** (p. 122)
18b. Ladyfern cover < 5% 19

19a. Drooping woodreed ≥ 25% cover .... **Sitka Alder/Drooping Woodreed Plant Association** (p. 124)
19b. Drooping woodreed < 5% cover 20

20a. Mesic forbs dominant understory species .... **Sitka Alder/Mesic Forb Plant Community Type** (p. 146)
20b. Mesic forbs not present .... Depauperate or undefined Sitka Alder community

17b. Sitka alder cover < 25% 21

21a. Mountain alder ≥ 25% cover 22

22a. Big-leaved sedge ≥ 25% cover or the dominant graminoid
.... **Mountain Alder/Big-leaved Sedge Plant Association** (p. 126)
22b. Big-leaved sedge < 25% cover 23

23a. Bladder sedge ≥ 25% cover or the dominant graminoid
.... **Mountain Alder/Bladder Sedge Plant Association** (p. 128)
23b. Bladder sedge < 25% cover 24

24a. Aquatic sedge ≥ 25% cover .... **Mountain Alder/Aquatic Sedge Plant Community** (p. 146)
24a. Aquatic sedge < 25% cover 25

25a. Woodrush sedge ≥ 25% cover .... **Mountain Alder/Woodrush Sedge Plant Community** (p. 146)
25b. Woodrush sedge < 25% cover 26

26a. Woolly sedge ≥ 25% cover .... **Mountain Alder/Woolly Sedge Plant Association** (p. 146)
26b. Woolly sedge < 25% cover 27

27a. Bluejoint reedgrass ≥ 25% cover ... **Mountain Alder/Bluejoint Reedgrass Plant Association** (p. 147)
27b. Bluejoint reedgrass < 25% cover 28

28a. Small-fruit bulrush ≥ 25% cover . **Mountain Alder/Small-fruit Bulrush Plant Community Type** (p. 147)
28b. Small-fruit bulrush < 25% cover 29

29a. Ladyfern ≥ 5% cover .... **Mountain Alder/Ladyfern Plant Association** (p. 130)
29b. Ladyfern < 5% cover 30

30a. Tall mannagrass ≥ 10% cover .... **Mountain Alder/Tall Mannagrass Plant Association** (p. 132)
30b. Tall mannagrass < 10% cover 31

31a. Red-osier dogwood ≥ 25% cover
.... **Mountain Alder-Red-osier Dogwood/Mesic Forb Plant Association** (p. 134)

31b. Red-osier dogwood < 25% cover 32

32a. Currant species ≥ 25% cover .... **Mountain Alder-Currants/Mesic Forb Plant Association** (p. 136)
32b. Currant species < 25% cover 33

33a. Common horsetail ≥ 25% cover ..... **Mountain Alder/Common Horsetail Plant Association** (p. 138)
33b. Common horsetail < 25% cover 34

34a. Oakfern ≥ 25% cover .... **Mountain Alder/Oakfern Plant Community Type** (p. 148)
34b. Oakfern < 25% cover 35

35a. Common cowparsnip ≥ 25% cover .... **Mountain Alder/Common Cowparsnip Plant Community Type** (p. 148)
35b. Common cowparsnip < 25% cover 36

36a. Densely-tufted sedge ≥ 25% cover .... **Mountain Alder/Densely-tufted Sedge Plant Community** (p. 147)
36b. Densely-tufted sedge < 25% cover 37

37a. Common snowberry ≥ 25% cover .. **Mountain Alder/Common Snowberry Plant Association** (p. 140)
37b. Common snowberry < 25% cover 38

38a. Dewey's sedge ≥ 10% cover or the dominant graminoid .... **Mountain Alder/Dewey's Sedge Plant Community Type** (p. 142)
38b. Dewey's sedge < 10% cover 39

39a. Kentucky bluegrass ≥ 25% cover or the dominant graminoid .... **Mountain Alder/Kentucky Bluegrass Plant Community Type** (p. 144)
39b. Kentucky bluegrass absent .... Depauperate or undefined Mountain Alder community

21b. Mountain alder < 25% cover 40

40a. Currants (specifically Prickly currant and Stinking currant) ≥ 25% cover 41

41a. Drooping woodreed ≥ 10% cover .... **Currants/Drooping Woodreed Plant Community Type** (p. 150)
41b. Drooping woodreed < 10% cover 42

42a. Tall mannagrass > 10% cover .... **Currants/Tall Mannagrass Plant Community Type** (p. 164)
42b. Tall mannagrass < 10% cover 43

43a. Mesic forbs dominant understory species .... **Currants/Mesic Forb Plant Community Type** (p. 164)
43b. Mesic forbs absent .... Depauperate or undefined Currants community

40b. Currants < 25% cover 44

44a. Water birch ≥ 25% cover 45

45a. "Wet" sedges (Aquatic sedge, Big-leaf sedge, Bladder sedge, Cusick's sedge) ≥ 25% cover .... **Water Birch/Wet Sedge Plant Community Type** (p. 165)
45b. "Wet" sedges < 25% cover 46

46a. Mesic forbs dominant understory species .. **Water Birch/Mesic Forb Plant Community Type** (p. 164)
46b. Mesic forbs absent .... Depauperate or undefined Water Birch community

44b. Water birch < 25% cover 47

47a. Alder-leaved Buckthorn ≥ 25% cover with mesic forb understory
.... **Alder-leaved Buckthorn/Mesic Forb Plant Community Type** (p. 165)

47b. Alder-leaved Buckthorn < 25% cover 48

48a. Red-osier dogwood ≥ 25% cover 49

49a. Brook saxifrage ≥ 25% cover and sideslope seep or spring habitat
.... **Red-osier Dogwood/Brook Saxifrage Plant Community Type** (p. 166)

49b. Brook saxifrage < 25% cover or streamside habitat (not seep slope or spring)
.... **Red-Osier Dogwood Plant Association** (p. 152)

48b. Red-osier dogwood < 25% cover 50

50b. Black hawthorn ≥ 25% cover .... **Black Hawthorn Plant Community Type** (p. 154)

50b. Black hawthorn < 25% cover 51

51a. Western serviceberry ≥ 25% cover .... **Western Serviceberry Plant Community Type** (p. 166)

51b. Western serviceberry < 25% cover 52

52a. Shrubby cinquefoil ≥ 10% cover 53

53a. Tufted hairgrass ≥ 10% cover .... **Shrubby Cinquefoil/Tufted Hairgrass Plant Association** (p. 156)

53b. Tufted hairgrass < 10% cover 54

54a. Kentucky bluegrass or other non-native grasses or "weedy" forbs present
.... **Shrubby Cinquefoil/Kentucky Bluegrass Plant Community Type** (p. 156)

54b. Kentucky bluegrass or other species mentioned above absent
.... 52b

52b. Shrubby cinquefoil < 10% cover 55

55a. Silver sagebrush ≥ 25% cover 56

56a. Tufted hairgrass ≥ 10% cover .... **Silver Sagebrush/Tufted Hairgrass Plant Association** (p. 159)

56b. Tufted hairgrass less than 10% cover 57

57a. Kentucky bluegrass or other non-native grasses or "weedy" forbs present
.... **Silver Sagebrush/Kentucky Bluegrass Plant Community Type** (p. 159)

57b. Kentucky bluegrass or other species mentioned above absent 58

58a. Cusick's bluegrass > 25% cover or the dominant graminoid
.... **Silver Sagebrush/Cusick's Bluegrass Plant Community Type** (p. 166)

58b. Cusick's bluegrass absent 55b

55b. Silver sagebrush < 25% cover 58

58a. Mountain big sagebrush ≥ 25% cover 59

59a. Cusick's bluegrass ≥ 5% cover ..... **Mountain Big Sagebrush/Cusick's Bluegrass Plant Association** (p. 162)

59b. Cusick's bluegrass less than 5% cover .... try upland associations in Blue Ochoco Guide

58b. Mountain big sagebrush < 25% cover .... Undefined type or repeat shrubby key or try herbaceous keys

Key to Herbaceous Plant Associations, Plant Community Types and Plant Communities

1a. Physical setting is graminoid-dominated open meadow or edge of pond or lake 2

2a. Higher elevation meadows in Eagle Cap, Elkhorn and Strawberry Mountains (generally > 6500 ft. elevation) 3

3a. Holm's sedge ≥ 25% cover or the dominant graminoid . . . . **Holm's Sedge Plant Association** (p. 170)
3b. Holm's sedge cover < 25% 4

4a. Star sedge ≥ 25% cover or the dominant graminoid . . . . **Star Sedge Plant Community Type** (p. 199)
4b. Star sedge < 25% cover 5

5a. Clustered field sedge ≥ 25% cover or the dominant graminoid **Clustered Field Sedge Plant Community Type** (p. 199)
5b. Clustered field sedge < 25% cover 6

6a. Few-flowered spikerush ≥ 25% cover and the dominant graminoid and site submerged or saturated through much of growing season . . . . **Few-flowered Spikerush Plant Community Type** (p. 199)
6b. Few-flowered spikerush < 25% cover or not the dominant graminoid and site different than above 7

7a. Woodrush sedge ≥ 25% cover or the dominant graminoid . . . . **Woodrush Sedge Plant Association** (p. 172)
7b. Woodrush sedge < 25% cover 8

2b. Middle elevations throughout Blue and Wallowa Mountains (generally 3000-6500 ft. elevation) 9

9a. Aquatic sedge ≥ 25% cover or the dominant graminoid . . . . **Aquatic Sedge Plant Association** (p. 174)
9b. Aquatic sedge < 25% cover 10

10a. Silvery sedge cover ≥ 25% or the dominant graminoid . . . . . **Silvery Sedge Plant Community Type** (p. 199)
10b. Silvery sedge < 25% cover 11

11a. Cusick's sedge ≥ 25% cover or the dominant graminoid . . . . **Cusick's Sedge Plant Association** (p. 176)
11b. Cusick's sedge < 25% cover 12

12a. Buckbean ≥ 25% cover . . . . **Buckbean Plant Community** (p. 200)
12b. Buckbean < 25% cover 13

13a. Bladder sedge ≥ 25% cover or the dominant graminoid . . . . **Bladder Sedge Plant Association** (p. 178)
13b. Bladder sedge < 25% cover 14

14a. Slender sedge ≥ 25% cover or the dominant graminoid . . . . **Slender Sedge Plant Community** (p. 200)
14b. Slender sedge < 25% cover 15

15a. Inflated sedge ≥ 25% cover or the dominant graminoid . . . . **Inflated Sedge Plant Association** (p. 180)
15b. Inflated sedge < 25% cover 16

16a. Delicate spikerush ≥ 25% cover or the dominant graminoid . . . . **Delicate Spikerush Plant Community** (p. 200)
16b. Delicate spikerush < 25% cover 17

17a. Creeping spikerush ≥ 25% cover or the dominant graminoid . . . **Creeping Spikerush Plant Association** (p. 182)
17b. Creeping spikerush < 25% cover 18

18a. Densely-tufted sedge ≥ 25% cover or the dominant graminoid .... **Densely-tufted Sedge Plant Association** (p. 184)
18b. Densely-tufted sedge < 25% cover 19

19a. Short-beaked sedge ≥ 25% cover or the dominant graminoid .... **Short-beaked Sedge Plant Community Type** (p. 200)
19b. Short-beaked sedge < 25% cover 20

20a. Saw-beak sedge ≥ 25% cover or the dominant graminoid .... **Saw-beak Sedge Plant Community Type** (p. 200)
20b. Saw-beak sedge < 25% cover 21

21a. Woolly sedge ≥ 25% cover or the dominant graminoid .... **Woolly Sedge Plant Association** (p. 186)
21b. Woolly sedge < 25% cover 22

22a. Small-fruit bulrush ≥ 25% cover or the dominant graminoid .... **Small-fruit Bulrush Plant Association** (p. 206)
22b. Small-fruit bulrush < 25% cover 23

23a. Sheldon's sedge ≥ 25% cover or the dominant graminoid .... **Sheldon's Sedge Plant Community Type** (p. 201)
23b. Sheldon's sedge < 25% cover 24

24a. Bluejoint reedgrass ≥ 25% cover or the dominant graminoid .... **Bluejoint Reedgrass Plant Association** (p. 188)
24b. Bluejoint reedgrass < 25% cover 25

25a. Tufted hairgrass ≥ 25% cover or the dominant graminoid .... **Tufted Hairgrass Plant Association** (p. 190)
25b. Tufted hairgrass < 25% cover 26

26a. Nebraska sedge ≥ 25% cover or the dominant graminoid . **Nebraska Sedge Plant Community Type** (p. 192)
26b. Nebraska sedge < 25% cover 27

27a. False hellebore ≥ 25% cover .... **False Hellebore Plant Community** (p. 201)
27b. False hellebore < 25% cover 28

28a. Baltic rush ≥ 25% cover or the dominant graminoid .... **Baltic Rush Plant Community Type** (p. 194)
28b. Baltic rush < 25% cover 29

29a. Thin bentgrass ≥ 25% cover or the dominant graminoid ..... **Thin Bentgrass Plant Community Type** (p. 201)
29b. Thin bentgrass < 25% cover 30

30a. Kentucky bluegrass and/or creeping bentgrass ≥ 25% cover or the dominant graminoid .... **Kentucky Bluegrass Plant Community Type** (p. 196)
30b. Kentucky bluegrass and/or creeping bentgrass < 25% cover 31

31a. Meadow foxtail ≥ 25% cover or the dominant graminoid ..... **Meadow Foxtail Plant Community Type** (p. 202)
31b. Meadow foxtail < 25% cover 32

32a. Common cattail ≥ 25% cover or the dominant graminoid ..... **Common Cattail Plant Community** (p. 202)
32b. Common cattail absent .... Undefined (generally early or mid-seral) meadow or aquatic community

1b. Setting is narrower valley, more truly a streamside setting or a seep or spring 33

33a. Big-leaved sedge ≥ 25% cover or the dominant graminoid (usually occurs where water-source is groundwater spring) .... **Big-leaved Sedge Plant Association** (p. 204)
33b. Big-leaved sedge < 25% cover 34

34a. Torrent sedge ≥ 25% cover or the dominant graminoid (occurs on large rocks along edge of stream) .... **Torrent Sedge Plant Community Type** (p. 212)
34b. Torrent sedge < 25% cover or setting different than above 35

35a. Maidenhair fern ≥ 25% cover .... **Maidenhair Fern Plant Community Type** (p. 213)
35b. Maidenhair fern < 25% cover 36

36a. Swamp onion > 25% cover .... **Swamp Onion Plant Community Type** (p. 213)
36b. Swamp onion < 25% cover 37

37a. Small-fruit bulrush ≥ 25% cover or the dominant graminoid .... **Small-fruit Bulrush Plant Association** (p. 206)
37b. Small-fruit bulrush < 25% cover 38

38a. Arrowleaf groundsel ≥ 25% cover .... **Arrowleaf Groundsel Plant Association** (p. 212)
38b. Arrowleaf groundsel < 25% cover 39

39a. Smooth-stemmed sedge ≥ 25% cover or the dominant graminoid .... **Smooth-stemmed Sedge Plant Community** (p. 212)
39b. Smooth-stemmed sedge < 25% cover 40

40a. Drooping woodreed ≥ 25% cover or the dominant graminoid ...... **Drooping Woodreed Plant Community** (p. 212)
40b. Drooping woodreed < 25% cover 41

41a. Densely-tufted sedge ≥ 25% cover or the dominant graminoid . **Densely-tufted Sedge Plant Association** (p. 184)
41b. Densely-tufted sedge < 25% cover 42

42a. Tall mannagrass ≥ 25% cover or the dominant graminoid .... **Tall Mannagrass Plant Association** (p. 208)
42b. Tall mannagrass < 25% cover 42

43a. Weak alkaligrass ≥ 25% cover or the dominant graminoid . **Weak Alkaligrass Plant Community Type** (p. 212)
43b. Weak alkaligrass < 25% cover 44

44a. Brook saxifrage ≥ 25% cover .... **Brook Saxifrage Plant Community Type** (p. 213)
44b. Brook saxifrage < 25% cover 45

45a. Common horsetail ≥ 25% cover .... **Common Horsetail Plant Association** (p. 210)
45b. Common horsetail < 25% cover 46

46a. American speedwell ≥ 25% cover .... **American Speedwell Plant Community Type** (p. 213)
46b. American speedwell < 25% cover ....
Undefined (generally early or mid-seral) streamside, seep or spring community or try herbaceous key again or try the landform key

LANDFORM KEY

1. This key is meant to:
   a. allow the user to narrow down the number of possible plant associations within a given location.
   b. provide the user with possible plant associations that may occur on a site that has been so altered from the potential late seral vegetation that use of the vegetative ley is impossible.
   c. prompt the user to search for remnant vegetation if previously stumped by the vegetative key and/or to look in the upland plant association guides for the Blue Mountains Ecoregion if necessary.
2. This key has not been field tested and is based on the authors' knowledge/recollections.
3. Subregions used are shown in Fig. 1 and described in Introduction.
4. Vegetation types and physical conditions given/listed in key are meant to apply only to National Forest lands - not to the entire area in each province/subregion. Also, this key only applies to lands for which wetlands were classified. Areas that were not classified are: Eagle Cap Wilderness, Strawberry Mountains Wilderness, North Fork John Day Wilderness, Wenaha-Tucannon Wilderness and unroaded portions of Hell's Canyon NRA.
5. This key is not strictly dichotamous - rather the reader must often choose among a number of choices according to the best fit to a landform or particular fluival surface and edaphic features of that surface.
6. Users should see the glossary for unfamiliar terms
7. Elevation breaks are only approximate. Differences in valley aspect and width and other local topographic features that affect local temperature and precipitation patterns prevent the use of absolute elevation breaks.
8. Soil saturation categories are relative and typical over an average of several seasons.
9. Types in parentheses ( ) are early or mid-seral communities that have been caused by over-grazing or other ground disturbance and/or by a drop in the water table.
10. Blue-Ochoco Guide refers to: Plant Associations of the Blue and Ochoco Mountains by Johnson and Clausnitzer, which covers the upland forested and non-forested plant associations for these mountain ranges.
11. Wallowa-Snake Guide refers to Plant Associations of the Wallowa-Snake Province by Johnson and Simon, which covers upland forested and non-forested plant associations for the Wallowa Mountains and the Snake River Canyon (page numbers are given only for the field guide version 5 ½" x 8" spiral bound).
12. Many forested terrace areas that are commonly called "Mixed conifer" are grand fir plant associations. These sites may be in early to mid-seral successional stages and thus be difficult for the user to assign to a particular plant association. The user should refer to: The Grand Fir Series of Northeastern Oregon and Southeastern Washington: Successional Stages and Management Guide by Clausnitzer for aid in identifying the plant association and the successional stage of the particular community.
13. Some of the graminoid types appear to be favored by the following environments:

Inflated sedge - standing, deep water (approx. 6-12")
Bladder sedge - standing or slow-miving deeper water (≥ 2")
Aquatic sedge - slow-moving surface water or saturated soil
Holm's sedge - high elevation, saturated soils
Big-leaved sedge - springs, i.e. groundwater
Small-fruit bulrush - moving water, either springs or edges of stream channels or drainageways within meadows
Cusick's sedge - groundwater, saturated, generally organic, soils
Densely-tufted sedge - moving water, disturbed or rocky site
Baltic rush - channelways and meadows, warmer sites that small-fruit bulrush?
Creeping spikerush - standing water, ponds or still edges of streams
Nebraska sedge - meadows, hydrology varies from shallow standing or slow-moving water to saturated or seasonally dry soils
Woolly sedge - seasonally wet/dry soils, i.e. fluctuating water table
Small-winged sedge - disturbed, seasonally unsaturated to dry meadows
Jones' and Hood's sedges - higher elevations, disturbed saturated to seasonally dry meadows
Swordleaf rush - disturbed areas along channels usually, but also in meadows; bare mineral material for establishment?

CONTINENTAL ZONE AND BLUE MOUNTAIN BASINS (see Fig. 1)

1a Broad (with gentle to steep sideslopes) or moderately broad (gentle to moderately steep sideslopes) flat- or trough-shaped valleys with low gradients (2% or less)
Perennial C or E type channels (occasionally DA channels)
Soil particle size: clay to cobble but mostly silt, sand and gravel 2

2a Low to moderate elevation (approx. 3000 to 6000 ft.) 3

3a. Alluvial bars (composed primarily of cobble, gravel and sand) . . . . **Creeping spikerush** (p. 182)
Common horsetail (p. 210)
Coyote willow (p. 114)
Rigid willow (p. 117)
Black cottonwood/Pacific willow (p. 88)

3b.Floodplains and overflow channels 4

4a. Soil particle size - predominantly silt 5

5a. Soil saturated to the surface through most of growing season . . . . **Aquatic sedge** (p. 174)
Bladder sedge (p. 178)
Inflated sedge (p. 180)

5b. Soil saturated to the surface for part of growing season . . . . **Woolly sedge** (p. 186)
Tufted hairgrass (p. 190)
(Nebraska sedge) (p. 192)
(Baltic rush) (p. 194)
Silver sagebrush/Tufted Hairgrass (p. 159)
Shrubby cinquefoil/Tufted Hairgrass (p. 156)

5c. Soil unsaturated for most of growing season . . . . **(Kentucky bluegrass)** (p. 196)
(Shrubby cinquefoil/Kentucky bluegrass) (p. 156)
(Silver sagebrush/Kentucky bluegrass) (p. 159)
Quaking aspen/Common snowberry (p. 80)
Ponderosa pine/Common snowberry-Floodplain (p. 72)
(Ponderosa pine/Kentucky bluegrass) (p. 74)

4b. Soil particle size - gravel, sand, silt and/or clay (streams with stronger flows and/or more erosion and deposition than in 4a, which allows for willow establishment) 6

6a. Soil saturated to the surface through most of growing season . . . . . **Small-fruit bulrush** (occasional) (p. 206)
Willow/Bladder sedge (p. 106)
Willow/Aquatic sedge (p. 108)
Mountain alder/Bladder Sedge? (p. 126)

6b. Soil saturated to the surface for part of growing season . . . . **Willow/Woolly sedge** (p. 110)

6c. Soil unsaturated for most of growing season . . . . **(Willow/Kentucky bluegrass)** (p. 112)

3c. Terraces .... **Mountain big sagebrush/Cusick's bluegrass** (p. 162)
Quaking aspen/Common snowberry (p. 80)
(Quaking aspen/Kentucky bluegrass) (p. 82)
Black cottonwood/Common snowberry (p. 94)
(Ponderosa pine/Kentucky bluegrass) (p. 74)
Ponderosa pine/Common snowberry-Floodplain (p. 72)

Ponderosa pine/Elk sedge (Blue-Ochoco Guide p. 109)
Douglas-fir/Common snowberry-Floodplain (p. 66)

2b. Cold air drainages at moderate to high elevations (approx. 4500-6500') (including headwater basins). Riparian vegetation is usually in the form of meadows with scattered shrub communities on banks and lodgepole pine on terraces. Generally these drainages have "climax" lodgepole pine around the edges and scattered singly or in clumps through the valley bottom meadows. Also the upland vegetation on the lower 1/3 to 2/3 of the surrounding sideslopes (usually grand fir or subalpine fir plant associations) often have dense stands of PICO when in mid-seral stage. Sedge plant associations occur in these cold air drainages where valley floors are fairly low gradient and/or have impermeable subsurface layers that perch water from springs/seeps that enter from adjacent toeslopes or from baseflow groundwater that collects in toeslopes.

7a. Streambanks on which vegetation is different that on adjacent floodplain, (these shrub communities are usually discontinuous, occurring where scouring or other streambank disturbance or flood event has exposed or deposited fresh mineral substrate; will also see "galleries" of shrubs on floodplains along abandoned stream channels) ....
Mountain alder-Currants/Mesic Forb (p. 136)
Mountain alder-Red-osier dogwood/Mesic Forb (p. 134)
(this type occurs occasionally)
(Mountain alder/Kentucky bluegrass) (p. 144)

7b. Floodplains

8a. Soil saturated to the surface through most of growing season .... **Bladder sedge** (p. 178)
Aquatic sedge (p. 174)
Lodgepole pine/Aquatic sedge (p. 50)

8b. Soil saturated to the surface for part of growing season .... **Tufted hairgrass** (p. 190)
(Nebraska sedge) (p. 192)
(Baltic rush) (p. 194)
(Kentucky bluegrass) (p. 196)
Lodgepole pine/Tufted hairgrass (p. 50)

8c. Soil unsaturated for most of growing season .... **(Lodgepole pine/Kentucky bluegrass)** (p. 51)

7c. Terraces .... Subalpine fir/Grouse huckleberry (Blue-Ochoco Guide p. 35)
Subalpine fir/Big huckleberry (Blue-Ochoco Guide p. 33)

2c. Headwater basins .... **Short-beak sedge** (p. 200)
Bladder sedge (p. 178)
Aquatic sedge (p. 174)
Tufted hairgrass (p. 190)
(Kentucky bluegrass) (p. 196)
Quaking aspen/Woolly sedge (p. 78)
Quaking aspen/Mesic forb (p. 84)
(Quaking aspen/Kentucky bluegrass) (p. 82)

1b. Narrow to moderately wide V- or trough-shaped valleys with moderate gradients (2-4%)
B-type channels
Soil particle size predominantly sand, gravel and cobble
Generally low to moderate elevations (approx. 3000-6000 ft.)

9a. Alluvial bars .... **Common horsetail** (p. 210)

9b. Streambanks and Floodplains .... **Mountain alder-Red-osier dogwood/Mesic Forb** (relatively lower elevations) (p. 134)
Mountain alder-Currants/Mesic Forb (relatively higher elevations) (p. 136)
Mountain alder-Common snowberry (p. 140)
Mountain alder/Common horsetail (p. 138)
Mountain alder/Tall mannagrass (p. 132)
Red-osier dogwood (p. 152)

9c. Terraces .... **Ponderosa pine/Common snowberry-Floodplain** (p. 72)
Douglas fir/Common snowberry-Floodplain (p. 66)
Grand fir/Queen's cup beadlily (Blue-Ochoco Guide p. 57)
Grand fir/Twinflower (Blue-Ochoco Guide p. 59)
Grand fir/Big huckleberry (Blue-Ochoco Guide p. 61)
other upland types found in Blue Ochoco guide

1c. Narrow V-shaped valleys with high gradients (4% or greater)
A-type channels
Soil particle size predominantly sand, gravel and cobble
Moderately high to high elevations
Dominant fluvial surface: streambanks .... **Mountain alder-Currants/Mesic Forb** (p. 136)
Mountain alder/Tall mannagrass (p. 132)

1d. Springs and seeps - can be surrounded entirely by upland vegetation or occur on a fluvial (wetland) surface surrounded by another wetland veg. type (the following list is not all-inclusive) .... **Big-leaved sedge** (p. 204)
Small-fruit bulrush (p. 206)
Aquatic sedge (p. 174)
Sheldon's sedge (p. 201)
(Nebraska sedge) (p. 192)
Mountain alder/Big-leaved sedge (p. 126)

XERIC CENTRAL HIGHLANDS AND JOHN DAY/CLARNO FORMATION (see Fig. 1)

1a. Broad or moderately broad valleys with low gradients
Perennial C streams

2a. Alluvial bars .... **Common horsetail** (p. 210)
Coyote willow (p. 114)
Rigid willow (p. 117)
Torrent sedge (Wall Creek specifically) (p. 212)
Black cottonwood/Pacific willow (p. 88)

2b. Floodplains .... **Mountain alder-Red-osier dogwood/Mesic Forb** (p. 134)
(Mountain alder/Kentucky bluegrass) (p. 144)
Black cottonwood/Mountain alder-red-osier dogwood (p. 90)

2c. Terraces .... **Black cottonwood/Common snowberry** (p. 94)
Ponderosa pine/Common snowberry-Floodplain (p. 72)
(Ponderosa pine/Kentucky bluegrass) (p. 74)
Douglas fir/Common snowberry-Floodplain (p. 66)
Grand fir/Common snowberry-Floodplain (p. 60)
Grand fir/Twinflower? (Blue-Ochoco Guide p. 59)
Grand fir/Queen's cup bead lily? (Blue-Ochoco Guide p. 57)

1b. Narrow V-shaped valleys with moderately high to high gradients (≥ 2%)
A and B-type channels

3a. South-facing and upper reaches of north-facing perennial drainages; also, intermittent reaches of north-facing drainages

4a. Alluvial bars .... **American speedwell** (p. 213)

4b. Streambanks and floodplains .... **Mountain alder-Red-osier dogwood/Mesic Forb** (p. 134)
Red-osier dogwood (p. 152)
Black hawthorn (p. 154)
Water birch/Mesic Forb?? (p. 164)
Quaking aspen/Common snowberry (p. 80)
Ponderosa pine/Common snowberry-Floodplain (p. 72)
Douglas fir/Common snowberry-Floodplain (p. 66)
Douglas fir/Ninebark (Blue-Ochoco Guide p. 83)
Douglas fir/Oceanspray (Blue-Ochoco Guide p. 85)

4c. Terraces .. **Ponderosa pine/Common snowberry-Floodplain** (often with abundant black hawthorn present) (p. 72)
Douglas fir/Common snowberry-Floodplain (p. 66)
Douglas fir/Ninebark (Blue-Ochoco Guide p. 83)
Douglas fir/Oceanspray (Blue-Ochoco Guide p. 85)

3b. North-facing perennial drainages

5a. Alluvial bars .... **American speedwell** (p. 213)

5b. Streambanks and floodplains .... **Mountain alder-Red-osier dogwood/Mesic Forb** (p. 134)
Mountain alder-Currants/Mesic Forb (p. 136)

5c. Terraces .... Grand fir/Queen's cup beadlily (Blue-Ochoco Guide p. 57)
Grand fir/Twinflower (Blue-Ochoco Guide p. 59)

1c. Headwaters

6a. Plateau collection areas; generally no stream channel formed; small in size and low gradient; surrounded by ponderosa pine, juniper, mountain big sagebrush and/or grassland types containing Sandberg's bluegrass ....
Timber oatgrass (*Danthonia intermedia*)
[not described in any vegetation classification- these areas appear to be dominated by Colorado rush (*Juncus confusus*) when disturbed]
Possibly Sandberg's bluegrass-onespike oatgrass (see Blue-Ochoco Guide p. 155)
Other unsampled, unclassified and generally highly disturbed (by livestock grazing) graminoid associations
Ponderosa pine/Common snowberry-Floodplain (p. 72)

6b. Springs/seeps at headwater source .... **Tufted hairgrass** (p. 190)
Aquatic sedge (p. 174)
Woolly sedge?? (p. 186)
Sheldon's sedge?? (p. 201)
Bladder sedge (p. 178)
(Nebraska sedge) (p. 192)
(Baltic rush) (p. 194)
(Kentucky bluegrass) (p. 196)
Quaking aspen/Common snowberry (p. 80)
Quaking aspen/Mesic Forb (p. 84)

MESIC FOREST ZONE 1 (see Fig. 1)

1a. Broad or moderately broad valleys with low gradients (1% or less)

2a. Low to moderate elevation (approx. 2500 to 4800 ft.); C-type channels; stream bed substrate size predominantly sand, gravel, cobble and boulder.

3a. Alluvial bars .... **Torrent sedge** (M. Fk., N. Fk., S. Fk. John Day River, Camas Creek) (p. 212)
Common horsetail (p. 210)
Coyote willow (p. 114)
Rigid willow (p. 117)
Black cottonwood/Pacific willow (p. 88)

3b. Streambanks, floodplains and overflow channels .... **Small-fruit bulrush** (p. 206)
Mountain alder-Red-osier dogwood/Mesic Forb (p. 134)
Mountain alder/Dewey's sedge (p. 142)
Mountain alder/Bladder sedge (where soils are saturated much of the growing season) (p. 128)
Red-osier dogwood (p. 152)
(Black hawthorn) (p. 154)
Willow/Mesic Forb (p. 116)
Black cottonwood/Mountain alder-Red-osier dogwood (p. 90)
Quaking aspen/Common snowberry (p. 80)
Quaking aspen/Mesic Forb (p. 84)
(Quaking aspen/Kentucky bluegrass) (p. 82)

3c. Terraces .... **Black cottonwood/Common snowberry** (p. 94)
Quaking aspen/Common snowberry (p. 80)
Ponderosa pine/Common snowberry-Floodplain (p. 72)
(Ponderosa pine/Kentucky bluegrass) (p. 74)
Douglas fir/Common snowberry-Floodplain (p. 66)
Grand fir/Common snowberry-Floodplain (p. 60)
Grand fir/Twinflower (Blue-Ochoco Guide p. 59)
Grand fir/Queen's cup beadlily (Blue-Ochoco Guide p. 57)

2b. Moderate to high elevations (approx. 4000 to 7500 ft.) (including headwater basins) and cold air drainage meadows; C- and E-type channels; stream bed substrate predominantly silt, sand and gravel

4a. Streambanks (these types usually discontinuous; establishing where scouring or other streambank disturbance or flood event has exposed or deposited fresh mineral substrate; will also see "galleries" of shrubs on floodplains along abandoned stream channels) .... **Mountain alder-Currants/Mesic Forb** (p. 136)

4b. Floodplains

5a. Soil saturated to the surface through most of the growing season .... **Aquatic sedge**(p. 174)
Bladder sedge (p. 178)
Inflated sedge (p. 180)
Densely-tufted sedge (p. 184)
(Nebraska sedge) (p. 192)
Holm's sedge (p. 170)
Woodrush sedge (p. 172)
Few-flowered spikerush (p. 199)

5b. Soil saturated to the surface for part of the growing season .... **Bluejoint reedgrass** (p. 188)
Tufted hairgrass (p. 190)
Sheldon's sedge (p. 201)
Swamp onion (p. 213)
(Baltic rush) (p. 194)
(Kentucky bluegrass) (p. 196)
(Meadow foxtail) (p. 202)
(False hellebore) (p. 201)
Lodgepole pine/Aquatic sedge?? (p. 50)

5c. Soil unsaturated for most of the growing season .... **Lodgepole pine/Tufted hairgrass** (p. 50)
(Lodgepole pine/Kentucky bluegrass) (p. 51)

4c. Terraces .... **Lodgepole pine/Tufted hairgrass** (p. 50)
(Lodgepole pine/Kentucky bluegrass) (p. 51)
Grand fir/Grouse huckleberry (Blue-Ochoco Guide p. 65)
Subalpine fir/Grouse huckleberry (Blue-Ochoco Guide p. 35)
Subalpine fir/Queen's cup beadlily (Blue-Ochoco Guide p. 27)
Subalpine fir/Twinflower (Blue-Ochoco Guide p. 29)
Subalpine fir/Big huckleberry? (Blue-Ochoco Guide p. 33)

1b. Narrow to moderately wide V- or trough-shaped valleys with moderate gradients (2-4%)
B-type channels
Soil and stream bed substrate particle size predominantely sand, gravel and cobble
Generally moderate elevations (3000 to 4800 ft.)

6a. Alluvial bars .... **Arrowleaf groundsel** (p. 212)
Tall mannagrass (p. 208)
Common horsetail (p. 210)

6b. Streambanks and narrow floodplains .... **Maidenhair fern** (Indian Creek drainage - PCRD) (p. 213)
Mountain alder-Red-osier dogwood/Mesic Forb (p. 134)
Mountain alder/Common horsetail (p. 138)
Mountain alder/Ladyfern (p. 130)
Mountain alder/Tall Mannagrass (p. 132)
Mountain alder/Dewey's sedge? (p. 142)
Sitka alder/Drooping woodreed (p. 124)
Grand fir/Rocky mountain maple-Floodplain (p. 58)
Grand fir/Ladyfern (p. 54)

6c. Terraces .... Grand fir/Twinflower (Blue-Ochoco Guide p. 59)
Grand fir/Pacific yew/Twinflower (Blue-Ochoco Guide p. 53)
Grand fir/Queen's cup beadlily (Blue-Ochoco Guide p. 57)
Grand fir/Pacific yew/Queen's cup beadlily (Blue-Ochoco Guide p. 51)
Grand fir/Big huckleberry (Blue-Ochoco Guide p. 61)

1c. Narrow V-shaped valleys with high gradients (4% or higher)
A-type channels
Soil and stream bed substrate particle size predominantly sand, gravel and cobble
Moderately high to high elevations (4500-7000 ft.)
Dominant fluvial surface: streambanks .... **Maidenhair fern** (Indian Creek drainage - PCRD) (p. 213)
Arrowleaf groundsel (p. 212)
Brook saxifrage (p. 213)
Currants/Tall mannagrass (p. 164)
Currants/Mesic Forb (p. 164)
Mountain alder-Currants/Mesic Forb (p. 136)
Mountain alder/Ladyfern (p. 130)
Subalpine fir/Arrowleaf groundsel (p. 36)
Engelmann spruce/Arrowleaf groundsel (p. 44)

1d. Springs and seeps - can be surrounded entirely by upland vegetation or occur on a fluvial (wetland) surface surrounded by another wetlands vegetation type (the following list is not all-inclusive) .... **Big-leaved sedge** (p. 204)
Small-fruit bulrush (p. 206)
Cusick's sedge (p. 176)
Sheldon's sedge (p. 201)
Aquatic sedge (p. 174)
Bladder sedge (p. 178)
Brook saxifrage (p. 213)
Swamp onion (p. 213)
Red-osier dogwood/Brook saxifrage (p. 166)
Mountain alder/Big-leaved sedge (p. 126)

MESIC FOREST ZONE 2 AND COLUMBIA PLATEAU (see Fig. 1)

1a. Broad or moderately broad valleys with low gradients (1% or less)

2a. Low to moderate elevation (up to 4800 ft.); C-type channels; stream bed substrate size predominantly sand, gravel and/or cobble; also D-type (braided) channels at middle elevations in the Wallowa Mountains

3a. Alluvial bars (composed primarily of gravel, sand and cobble) .... **Common horsetail** (p. 210)
Coyote willow (p. 114)
Rigid willow (p. 117)
Black cottonwood/Pacific willow (p. 88)
Red alder/Alluvial Bar (Walla Walla RD) (p. 100)

3b. Streambanks, floodplains and overflow channels .... **Small-fruit bulrush** (p. 206)
Mountain alder-Red-osier dogwood/Mesic Forb (p. 134)
Mountain alder/Dewey's sedge (p. 142)
Red-osier dogwood (p. 152)
Black hawthorn (p. 154)
Black cottonwood/Mountain alder-Red-osier dogwood (p. 90)
Black cottonwood/Rocky Mountain maple (p. 92)
Quaking aspen/Common snowberry (p. 80)
Quaking aspen/Mesic Forb (p. 84)
(Quaking aspen/Kentucky bluegrass) (p. 82)
Red alder/Pacific ninebark (p. 98)
Other **Red alder** types - Walla Walla RD
Grand fir/Common snowberry-Floodplain (p. 60)
Grand fir/Rocky Mountain maple-Floodplain (p. 58)

3c. Terraces .... **Black hawthorn** (p. 154)
Black cottonwood/Common snowberry (p. 94)
Ponderosa pine/Common snowberry-Floodplain (p. 72)
(Ponderosa pine/Kentucky bluegrass) (p. 74)
Douglas fir/Common snowberry-Floodplain (p. 66)
Grand fir/Common snowberry-Floodplain (p. 60)
Grand fir/Rocky Mountain maple-Floodplain (p. 58)
Grand fir/Twinflower (Blue-Ochoco Guide p. 59; Wallowa-Snake Guide p. 209)
Grand fir/Queen's cup beadlily (Blue-Ochoco Guide p. 57; Wallowa-Snake Guide p. 197)
Grand fir/False bugbane (Blue-Ochoco Guide p. 49)

2b. Moderate to high elevations (above 4800 ft.) (including headwater basins) and cold air drainage meadows; E-type channels; stream bed substrate predominantly silt and sand

4a. Streambanks (these types usually discontinuous; occurring where scouring or other streambank disturbance or flood event has exposed or deposited fresh mineral substrate; will also see "galleries" of shrubs on floodplains along abandoned stream channels) .... **Mountain alder-Currants/Mesic Forb** (p. 136)

4b. Floodplains

5a. Soil saturated to the surface through most of the growing season .... **Aquatic sedge** (p. 174)
Bladder sedge (p. 178)
Inflated sedge (p. 180)
Densely-tufted sedge (p. 184)
(Nebraska sedge) (p. 192)
Holm's sedge (p. 170)
Woodrush sedge (p. 172)
Few-flowered spikerush (p. 199)

5b. Soil saturated to the surface for part of the growing season .... **Bluejoint reedgrass** (p. 188)
Tufted hairgrass (p. 190)
Sheldon's sedge (p. 201)
Swamp onion (p. 213)
(Baltic rush) (p. 194)
(Kentucky bluegrass) (p. 196)
(Meadow foxtail) (p. 202)
(False hellebore) (p. 201)
Lodgepole pine/Aquatic sedge? (p. 50)

5c. Soil unsaturated for most of the growing season .... **Lodgepole pine/Tufted hairgrass** (p. 50)
(Lodgepole pine/Kentucky bluegrass) (p. 51)

4c. Terraces .... **Lodgepole pine/Tufted hairgrass** (p. 50)
(Lodgepole pine/Kentucky bluegrass) (p. 51)
Lodgepole pine (Grand fir)/Grouse huckleberry-Pinegrass (Blue-Ochoco Guide p. 77)
Lodgepole pine (Subalpine fir)/Grouse huckleberry (Blue-Ochoco Guide p. 41; Wallowa-Snake Guide p. 176)
Subalpine fir/Queen's cup beadlily (Blue-Ochoco Guide p. 27; Wallowa Snake Guide p. 186)
Subalpine fir/Twinflower (Blue-Ochoco Guide p. 29; Wallowa-Snake Guide p. 190)

4d. Groundwater-fed seeps located on floodplains/terraces .... **Cusick's sedge** (p. 176)
Small-fruit bulrush (p. 206)
Big-leaved sedge? (p. 204)
Densely-tufted sedge (p. 184)
Aquatic sedge (p. 174)

4e. Headwater basins .... **Aquatic sedge** (p. 174)
Bladder sedge (p. 178)
Tufted hairgrass (p. 190)
Silvery sedge (p. 199)
(False hellebore) (p. 201)
(Meadow foxtail) (p. 202)
Holm's sedge (p. 170)
Woodrush sedge (p. 172)
Few-flowered spikerush (p. 199)
Clustered field sedge (p. 199)
Quaking aspen/Aquatic sedge (p. 84)
Quaking aspen/Bluejoint reedgrass (p. 84)
Quaking aspen/Mesic Forb (p. 84)

1b. Narrow to moderately wide V- or trough-shaped valleys with moderate gradients (2-4%)
B-type channels
Soil and stream bed substrate particle size predominantely sand, gravel and cobble
Generally moderate elevations (3000-4800 ft.)

5a. Alluvial bars .... **Arrowleaf groundsel?** (p. 212)
Tall mannagrass (p. 208)
Common horsetail (p. 210)

5b. Streambanks and floodplains .... **Mountain alder-Red-osier dogwood/Mesic Forb** (p. 134)
Mountain alder/Common horsetail (p. 138)
Mountain alder/Ladyfern (p. 130)
Mountain alder/Tall Mannagrass (p. 132)
Mountain alder/Dewey's sedge (p. 142)
Sitka alder/Ladyfern (p. 122)
Sitka alder/Drooping woodreed (p. 124)
Sitka alder/Mesic Forb (p. 146)
Willow/Mesic Forb (p. 116)
Black cottonwood/Rocky Mountain maple (p. 92)
Engelmann spruce/Ladyfern (p. 42)
Engelmann spruce/Arrowleaf groundsel (p. 44)
Douglas-fir/Rocky Mountain maple-Mallow ninebark-Floodplain (p. 64)
Grand fir/Rocky Mountain maple-Floodplain (p. 58)
Grand fir/Oakfern (p. 56)

5c. Terraces .... **Grand fir/Rocky mountain maple-Floodplain** (p. 58)
Grand fir/Twinflower (Blue-Ochoco Guide p. 59; Wallowa Snake Guide p. 209)
Grand fir/Pacific yew/Twinflower (Blue-Ochoco Guide p. 53)
Grand fir/Queen's cup beadlily (Blue-Ochoco p. 57; Wallowa-Snake Guide p. 197)
Grand fir/Pacific yew/Queen's cup beadlily (Blue-Ochoco Guide p. 51; Wallowa-Snake Guide p. 201)
Grand fir/Big huckleberry (Blue-Ochoco Guide p. 61; Wallowa-Snake Guide p. 204)
Grand fir/False Bugbane (Blue-Ochoco Guide p. 49)

1c. Narrow V-shaped valleys with high gradients (4% or higher)
A-type channels
Soil and stream bed substrate particle size predominantly sand, gravel and cobble
Moderately high to high elevations (4500-7000 ft.)
Dominant fluvial surface: streambanks .... **Arrowleaf groundsel** (p. 212)
Brook saxifrage (p. 213)
Currants/Tall mannagrass (p. 164)
Currants/Mesic Forb (p. 164)
Mountain alder-Currants/Mesic Forb (p. 136)
Mountain alder/Tell mannagrass (p. 132)
Sitka alder/Ladyfern (p. 122)
Sitka alder/Drooping woodreed (p. 124)
Engelmann spruce/Ladyfern (p. 42)
Subalpine fir/Ladyfern (p. 34)

1d. Springs and seeps - can be surrounded entirely by upland vegetation or occur on a fluvial (wetland) surface surrounded by another wetlands vegetation type (the following list is not all-inclusive) .... **Big-leaved sedge** (p. 204)
Small-fruit bulrush (p. 206)
Aquatic sedge (p. 174)
Bladder sedge (p. 178)
Cusick's sedge (p. 176)
Sheldon's sedge (p. 201)
Swamp onion (p. 213)
Brook saxifrage (p. 213)
Undergreen willow/Holm's sedge (p. 104)
Mountain alder/Big-leaved sedge (p. 126)

General Management Considerations for Subalpine Fir

Subalpine fir (*Abies lasiocarpa*) grows in locations with cold, humid climates: summers are cool, winters are cold and there are deep winter snowpacks, the latter being more important than total precipitation. Frequent summer frosts may also occur. Mean annual temperatures are 25° to 40°F. Mean annual precipitation is greater than 24". Cone production in closed forest (typical of riparian settings) begins after the trees are 20 yrs. old, and maximum cone production occurs when trees are 150-200 yrs. old. Good crops occur every 3 yrs. on the average. Most seed is dispersed by wind as cones disintegrate on trees in late summer and fall, and seeds lie dormant under snowpack until spring. Germination can occur on a variety of seedbeds from bare mineral soil to duff. Seedling establishment and early survival is favored by shade. Early root growth is slow. Roots eventually develop into a shallow lateral system. Shoot growth is slow, especially on wet sites. In a closed forest setting, mature trees may average only 10-20 in. dbh at 150-200 yrs. of age. Subalpine fir has high rates of transpiration, thus necessitating its growth where soil moisture is high.

Subalpine fir is associated with Engelmann spruce (*Picea engelmannii*) and lodgepole pine (*Pinus contorta*). Subalpine fir exhibits more rapid growth on duff than Engelmann spruce. Subalpine fir is very shade tolerant; when shade is greater than 50%, subalpine fir seedlings can outcompete Engelmann spruce and lodgepole pine seedlings. Engelmann spruce, however, is generally longer-lived and achieves greater heights than subalpine fir. Under late seral conditions on active floodplains (which would be cool, moist sites) Engelmann spruce is probably able to regenerate as well as subalpine fir and the two species are often co-dominant. Most late seral riparian stands in the subalpine fir series are multi-aged because of fire, insects or mortality from disease, windthrow or flood events.

Subalpine fir is susceptible to diseases that cause heartrot, rootrot, buttrot and fir broom rust (*Melampsorella caryophyllacearum*). Trees are susceptible to windthrow, which is generally attributed to their shallow lateral root systems. Several insects feed on and cause mortality of subalpine fir, including western spruce budworm (*Choristoneura occidentalis*) and western balsam bark beetle (*Dryocoetes confusus*).

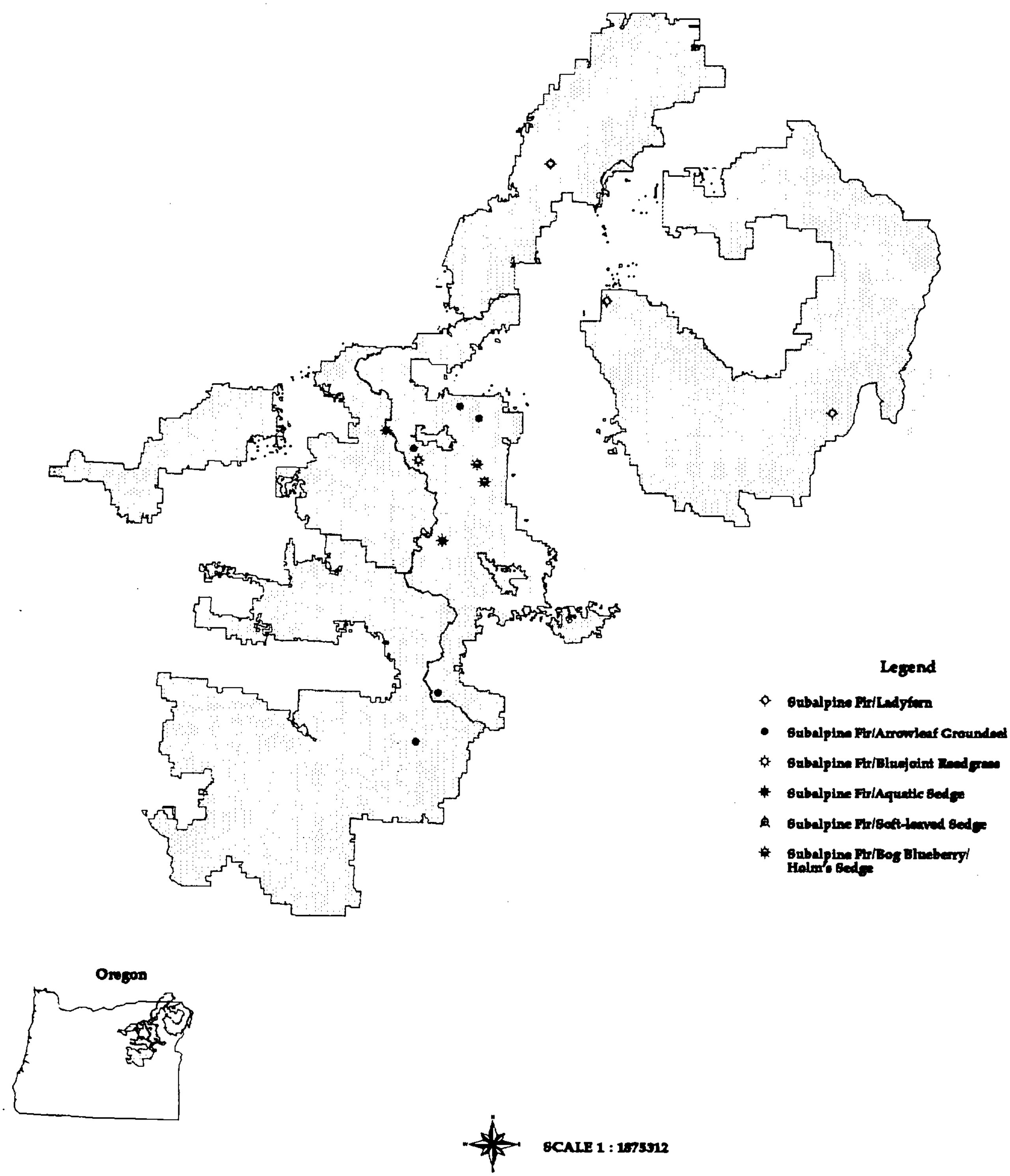
Subalpine fir is highly susceptible to fire because it has: thin bark; bark that readily ignites; shallow roots which are susceptible to soil heating; low growing branches; high stand density; highly flammable foliage; and moderate to heavy fruticose lichen growth hanging from its branches. The fuel structure in subalpine fir stands promotes stand-replacing fires, which burn through the crowns of the trees. Surface fires can also kill trees by girdling the bole through the thin bark. Moist middle and upper elevation subalpine fir stands generally experience high intensity, stand-replacing fires at 100+ year intervals. Stands in riparian areas probably have longer fire return intervals than surrounding upland subalpine fir. Lodgepole pine seedlings that establish on a burned surface after a fire can suppress subalpine fir seedlings. It can take several years after a fire for subalpine fir to start reproducing on a site.

Several species of small mammals and birds feed on or nest in subalpine fir trees including: snowshoe hares, flying squirrels, pine martens, chipmunks, voles, mice, shrews, woodpeckers, flycatchers, kinglets, nuthatches, juncos, thrushes, chickadees, crossbills, pine siskens, owls and grouse. Blue grouse eat needles and buds of subalpine fir. Subalpine fir can be highly palatable to mountain goats during the winter and spring. Mule deer, elk and black bear use subalpine fir habitats for summer range; stands provide good hiding cover, calving and lambing areas for elk and bighorn sheep. (Information taken from Alexander and others 1990; Uchytil 1991a)

Figure 3. Facing page.
Sample sites for subalpine fir types. This map does not represent the actual distribution of subalpine fir types.

Subalpine Fir Plant Associations,

Community Types & Communities



Subalpine Fir/Lady Fern Plant Association

Abies lasiocarpa/Athyrium filix-femina CEF332
ABLA2/ATFI n=3

PHYSICAL ENVIRONMENT

The subalpine fir/lady fern plant association was sampled in the northern portions of the Umatilla (Walla Walla RD) and Wallowa-Whitman National Forests (La Grande RD; Hell's Canyon NRA). Sites are located in very narrow (<33 feet wide) V-shaped valleys and headwaters at mid-elevations between 4800 and 5300 feet. Valley gradients range from 2% to 10% with most sites in moderate to very high gradient valleys (4% 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 an 8-20 inch depth by September. Soils are shallow alluvial silt, sand and gravel over cobbles. Depths to the old streambed varied from 9 to 16 inches. Rosgen stream types associated with sampled sites include A4, A6, and B3 streams. Streams are generally very narrow with 1-5 foot widths.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	5127	219
Plot Aspect (°)	330	65
Plot Slope (%)	6	4
Valley Width (m)	5	0
Valley Gradient (%)	6	4
Valley Aspect (°)	330	65
Soil Surface Cover (%)		
Submerged	8	8
Bare Ground	5	8
Rock	1	1
Moss	54	36
Liverwort	3	6
Litter	2	24

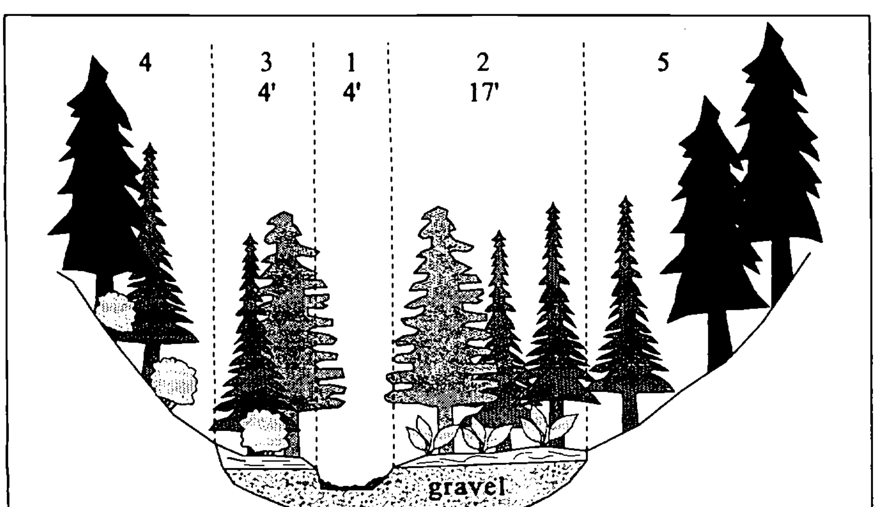
Soil Profile Characteristics

Bedrock/Parent Material(s): basalt
Water Table Depth (cm): 20-51
Total Rooting Depth (cm): 10-25

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



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

Figure 4. *N. Fk. Clark Creek, La Grande RD, Wallowa-Whitman NF; mod. gradient, mod. elevation, V-shaped valley; Mesic Forest Zone 1.*

VEGETATION COMPOSITION

Principal Species		Con	Cov
Dominant Overstory Trees			
ABLA2	Subalpine fir	67	10
PIEN	Engelmann spruce	33	20
Subdominant Overstory Trees			
ABLA2	Subalpine fir	67	13
PIEN	Engelmann spruce	33	3
Understory Trees			
PIEN	Engelmann spruce	67	7
ABLA2	Subalpine fir	33	5
ABGR	Grand fir	33	3
Tall Shrubs			
RILA	Prickly currant	100	6
ALSI	Sitka alder	67	15
Perennial Forbs			
STAM	Clasp-leaf twistedstalk	100	18
TRCA3	False bugbane	100	13
SAAR4	Brook saxifrage	100	5
MOCO	Heart-leaved miner's-lettuce	100	4
SETR	Arrow-leaf groundsel	100	4
ACCO	Columbia monkshood	100	3
GATR	Sweet-scented bedstraw	100	3
MIPE	Alpine mitrewort	100	2
TITRU	Cool-wort foam-flower	100	1
OSCH	Mountain sweet-cicely	100	1
MECI	Tall bluebells	67	6
ANAR2	Sharptooth angelica	67	2
VIGL	Stream violet	67	2
ARCO	Heartleaf arnica	67	2
THOC	Western meadowrue	67	2
Perennial Grasses			
CILA2	Drooping woodreed	100	2
BRVU	Columbia brome	67	8
GLEL	Tall mannagrass	67	5
Sedges and Rushes			
CADI	Soft-leaved sedge	67	4
Ferns and Horsetails			
ATFI	Lady fern	100	48

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, cool-wort foam-flower, and mountain sweet-cicely. Drooping woodreed was a constant understory component. Associated grasses and sedges include Columbia brome, tall mannagrass, and soft-leaved sedge. Upland vegetation types adjacent to sites sampled are: terraces - subalpine fir/big huckleberry; sideslopes - subalpine fir/big huckleberry, other subalpine fir associations.

MANAGEMENT

Sites supporting the subalpine fir/lady fern plant association are located on narrow, wet fluvial surfaces. Such stands are important to the maintenance of watershed values by providing shade, woody debris, and streambank stability on low order streams (e.g., first order - third order). Wildlife use by songbirds and small mammals is moderate but wild and domestic ungulate use is low. Lady fern has low forage value (Walkup 1991a) and associated shrubs provide limited browse. Sites representing the ABLA2/ATFI association are generally not suitable for intensive timber production (Pfister and others 1977).

Stand Characteristics

Species	*BA*	*Range*	*Site Index*	*Range*
ABLA2	25	10-40	76	—

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Needle-leaved Evergreen, WATER REGIME (NONTIDAL) Seasonally Flooded to Saturated.

OTHER STUDIES

Kovalchik (1992) describes the ABLA2/ATFI plant association in eastern Washington. Pfister and others (1977) have described the ABLA2/OPHO habitat type which shares elements with ABLA2/ATFI.

Subalpine Fir/Arrow-leaf Groundsel Plant Association

Abies lasiocarpa/Senecio triangularis CEF333
ABLA2/SETR n=5

PHYSICAL ENVIRONMENT

Plots representing the ABLA2/SETR plant association are located in the Wallowa-Whitman (Unity and La Grande RDs) and northern Malheur (Prairie City And Burns RDs) National Forests. These sites are associated with gravel bars, streambanks, and floodplains between 4600 and 6500 feet. Moderate and high gradient (4%-8%), V-shaped or trough-shaped valleys, 15-200 feet wide are characteristic landforms. Soils reflect the dynamic nature of these streamside habitats: layers of coarse-textured sand and gravel 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 ABLA2/ATFI plant association. The water table ranges between 1 and 2 feet below the surface during the growing season. Rosgen stream types associated with sampled sites include A4, B4 and B4c (low gradient) streams. Streams are generally narrow with widths of 1-15 feet.

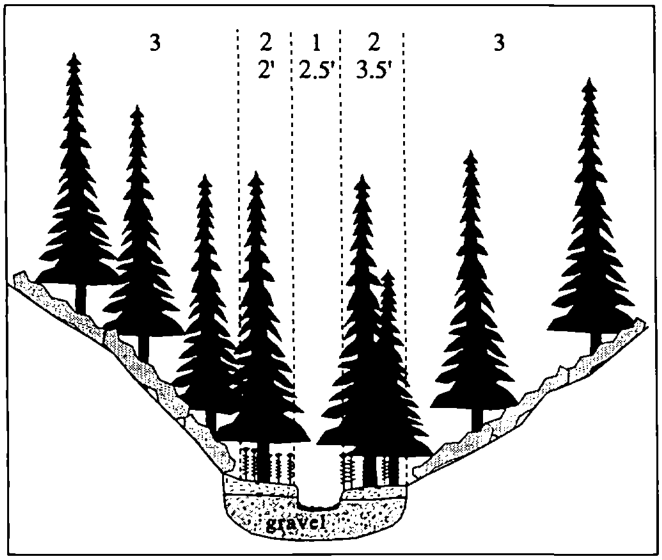


Figure 5. *Lookout Creek, Unity RD, Wallowa-Whitman NF; high gradient, mod. high elevation, V-shaped valley; Mesic Forest Zone 1*

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	5414	813
Plot Aspect (°)	93	46
Plot Slope (%)	6	3
Valley Width (m)	20	30
Valley Gradient (%)	5	2
Valley Aspect (°)	61	34
Soil Surface Cover (%)		
Submerged	8	10
Bare Ground	2	2
Gravel	8	12
Rock	6	8
Moss	32	34
Liverwort	4	7
Litter	39	22

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt, rhyolite
Water Table Depth (cm)	30-64
Total Rooting Depth (cm)	23-76
Depth to Redoximorphic Features (cm)	25-40
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

1 A4 stream reach
2 **Subalpine fir/arrowleaf groundsel,** banks and floodplain
3 **Subalpine fir/grouse huckleberry,** north- and south-facing sideslopes

VEGETATION COMPOSITION

Principal Species		Con	Cov
Dominant Overstory Trees			
ABLA2	Subalpine fir	40	23
PIEN	Engelmann spruce	40	9
Subdominant Overstory Trees			
PIEN	Engelmann spruce	40	11
ABLA2	Subalpine fir	20	35
Understory Trees			
ABLA2	Subalpine fir	80	5
PIEN	Engelmann spruce	40	7
Tall Shrubs			
RIHU	Stinking currant	100	21
RILA	Prickly currant	100	16
ROGY	Bald-hip rose	40	4
Low Shrubs			
VASC	Grouse huckleberry	60	3
LIBO2	American twinflower	40	3
Perennial Forbs			
SETR	Arrow-leaf groundsel	100	13
SAAR4	Brook saxifrage	100	10
OSCH	Mountain sweet-cicely	100	1
MOCO	Heart-leaved miner's-lettuce	80	11
ACCO	Columbia monkshood	80	3
ARCO	Heartleaf arnica	80	2
PYSE	Side-bells pyrola	80	2
GATR	Sweet-scented bedstraw	80	2
TITRU	Cool-wort foam-flower	60	17
STAM	Clasp-leaf twistedstalk	60	3
HELA	Common cowparsnip	60	3
ANAR2	Sharptooth angelica	60	3
THOC	Western meadowrue	40	16
MIPE	Alpine mitrewort	40	8
CIAL	Enchanter's nightshade	40	6
PAFI	Rocky mountain grass-of-parnassus	40	3
GEMA	Large-leaf avens	40	2
MECI	Tall bluebells	40	2
Perennial Grasses			
GLEL	Tall mannagrass	100	3
CILA2	Drooping woodreed	100	2

This plant association is dominated by subalpine fir in late seral and climax stands. Engelmann spruce is an important seral tree and dominates subclimax stands. Stinking 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 with mean coverage of 13%. Other important species of the herbaceous layer include brook saxifrage, heart-leaved miner's-lettuce, cool-wort foam flower, western meadowrue, alpine mitrewort, tall mannagrass, and drooping woodreed. In contrast to the ABLA2/ATFI association with mean moss coverage of 54%, moss cover is 32% in the ABLA2/SETR type. Upland vegetation types adjacent to sampled sites are: terraces - subalpine fir/twinflower, other subalpine fir associations; sideslopes - subalpine fir/grouse huckleberry, other subalpine fir associations, grand fir/Pacific yew-twinflower.

MANAGEMENT

The subalpine fir/arrow-leaf groundsel association has management opportunities and limitations that are similar to the ABLA2/ATFI type. Sites supporting ABLA2/SETR are not suitable for intensive timber production due to the small, narrow stands and wet soils, which result in operational and silvicultural constraints. Elk and deer use of these areas is high; stands provide thermal cover for wild ungulates during the warm summer season (Johnson and Simon 1987). In addition songbirds, small mammals, and bear use this habitat. Watershed values are protected by riparian stringers of the ABLA2/SETR type.

Stand Characteristics

Species	*BA*	*Range*	*Site Index*	*Range*
ABLA2	48	10-85	68	65-71
PIEN	30	—	39	—
LAOC	15	10-20	51	—
PICO	15	—	—	—

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Needle-leaved Evergreen, WATER REGIME (NONTIDAL) Seasonally Flooded to Saturated.

OTHER STUDIES

The ABLA2/SETR is similar to the ABLA2/STAM type (Kovalchik 1992, Steele and others 1983, Cooper and others 1987, Steele and others 1981, Mauk and Henderson 1984, and Johnson and Simon 1987) and the ABLA2/GATR type (Pfister and others 1977). The ABLA2/GYDR type of northeastern Washington contains elements of the ABLA2/SETR plant association (Clausnitzer and Zamora 1987).

Miscellaneous Subalpine Fir Types

Subalpine Fir/Aquatic Sedge Plant Community Type

Abies lasiocarpa/Carex aquatilis
ABLA2/CAAQ n=2

The ABLA2/CAAQ community type is represented by two plots on N. Fk. John Day RD (Umatilla NF) and Baker RD (Wallowa-Whitman NF). This type was sampled on a streambank and a terrace at moderate elevations (4800-5400 feet). Where this community was sampled on a terrace, the water table is perched. Adjacent stream reach types are E4 and B4. Engelmann spruce (PIEN) is a late seral overstory component on these sites and subalpine fir (ABLA2) is present and reproducing successfully. Shrubs are poorly represented and the understory is dominated by the wet-site grasses and sedges, including aquatic sedge (CAAQ), panicled bulrush (SCMI), and bluejoint reedgrass (CACA). Musk monkey-flower (MIMO), brook saxifrage (SAAR4), and Sitka burnet (SASI2) are major forbs. Soils are composed of depositional layers of silt loam and sandy loam formed by seasonal flooding. The water table drops to 2-3 feet by the middle of the growing season. Adjacent upland vegetation types are: grand fir associations, Douglas fir/pinegrass and subalpine fir/grouse huckleberry.

Subalpine Fir/Bluejoint Reedgrass Plant Association

Abies lasiocarpa/Calamagrostis canadensis
ABLA2/CACA n=1

The subalpine fir/bluejoint reedgrass habitat type has been described by Pfister and others (1977), Steele and others (1981), Steele and others (1983), Mauk and Henderson (1984), and Hansen and others (1995). It was sampled at mid-elevation on Sheep Creek on La Grande RD (Wallowa-Whitman NF) on an inactive floodplain adjacent to a C3 stream reach. A scattered seral overstory of lodgepole pine (PICO) dominates a tree understory composed of subalpine fir (ABLA2), Engelmann spruce (PIEN), and western larch (LAOC). Bluejoint reedgrass (CACA) dominates the herbaceous layer with coverage of 50%. Associated species include alpine timothy (PHPR), arnica (ARCO), cowparsnip (HELA), Sitka burnet (SASI2), western polemonium (POOC), and stinking currant (RIHU). Forage value is moderate to high. 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 and others 1995). Timber management opportunities are limited by proximity to the stream, wet soils, and competition from bluejoint reedgrass.

Subalpine Fir/Soft-leaved Sedge Plant Community Type

Abies lasiocarpa/Carex disperma
ABLA2/CADI n=2

Two sites (Prairie City RD, Malheur NF; La Grande RD, Wallowa-Whitman NF) on floodplains at 5100 and 6000 feet elevation support a community type of subalpine fir, Engelmann spruce (PIEN), and soft-leaved sedge (CADI). Important understory species are smooth-stemmed sedge (CALA), tall mannagrass (GLEL), weak alkaligrass (PUPA), false bugbane (TRCA3), alpine mitrewort (MIPE), mountain alder (ALIN), stinking currant (RIHU), and prickly currant (RILA). Soils are composed of an organic layer over silt loam and/or cobble. The water table is at a depth of 8-12 inches during the growing season. Adjacent stream reach types were E4 and E6. These wet sites provide wildlife habitat and protection of watershed values. Opportunities for intensive timber management are limited in this cold, wet community type. Adjacent upland vegetation types are: subalpine fir/grouse huckleberry, lodgepole pine(subalpine fir)/grouse huckleberry-pinegrass and subalpine fir/big huckleberry.

Subalpine Fir/Bog Blueberry/Holm's Sedge Plant Community Type

Abies lasiocarpa/Vaccinium uliginosum/Carex scopulorum
ABLA2/VAUL/CASC5 n=2

Two plots located in the Elkhorn Mountains (Baker RD, Wallowa-Whitman NF) represent the subalpine fir/bog blueberry/Holm's sedge community type. It occurred on the edge of two wet basins at 6700-7000 feet. Subalpine fir (ABLA2), Engelmann spruce (PIEN), and lodgepole pine (PICO) form a scattered layer as individual trees are established on hummocks. The open nature of the tree canopy will promote codominance of these overstory members. Bog blueberry (VAUL)dominates the shrub layer; alpine laurel (KAMI), grouse huckleberry (VASC) and red mountainheath (PHEM) are associated shrubs. Holm's sedge (CASC5) creates a dense sward in the microswales on the site with mean coverage of 65%. Soils are histosols that remain wet to saturated throughout the growing season.

General Management Considerations for Engelmann Spruce

Engelmann spruce *(Picea engelmannii)* grows in locations with climates that are humid and have long, cold winters and short, cool summers. Average annual temperatures are near freezing and frost can occur in any month of the year. Stands grow best on moderately deep, well-drained, loamy sands and silts and on silt and clay loam developed from volcanic and sedimentary rock. Unfavorable substrates are rocky glacial till, heavy clay surface soils, and shallow, dry, coarse-textured soils. Engelmann spruce can withstand a high water table, but the water must be generally fairly well-aerated (this is more likely to occur in riparian floodplain soils than in wet meadows where large stands of rhizomatous sedges occur). Cone and seed production can begin on 15-40 yr. old trees, but the best crops are produced by dominant trees that are 150-200 yrs. old. Good seed crops occur every 2 to 5 yrs. on average. Most seeds are disseminated by wind and can germinate on duff, litter, humus, decaying wood or mineral soil where herbaceous plant competition is minimal. Seedbeds must be moist and air temperatures 45° F or higher. Germination is generally higher on mineral seedbeds, which have more stable moisture conditions, than on organic substrates. Seeds will germinate in all light intensities, but 40-60% shade is best. Viability of Engelmann spruce seeds is higher than that of subalpine fir seeds, but at extremely low light conditions, Engelmann spruce seedlings do not compete favorably with true fir seedlings. Seedlings are extremely sensitive to heat in the succulent stage and to frost when less than 10 weeks old. Initial root penetration is slow. The juvenile taproot does not persist and eventually the tree develops a shallow, lateral root system; where the water table is high, most of the roots may be in the first 12-18" of soil. Engelmann spruce is very long-lived compared to its associate conifers; dominant trees can live to 250-450 yrs. The trees will grow steadily for 300 yrs. if there is sufficient space. Leaf water vapor conduction is higher than in subalpine fir and annual canopy transpiration is about 80% > lodgepole pine and 50% > subalpine fir.

Windfall is a risk to Engelmann spruce growing in valley bottoms that are parallel to prevailing winds and in sideslope spring habitats that are in saddles or near ridgetops. The most serious damaging insects are the spruce beetle *(Dendroctonus rufipennis)* and the western spruce budworm *(Choristoneura occidentalis)*. Most large outbreaks of spruce beetles begin in older stands that have been subjected to catastrophic wind storms; losses may not be great in adjacent stands. The most common diseases afflicting Engelmann spruce are butt and trunk rots and spruce broom rust.

Engelmann spruce is very fire sensitive and is generally killed by even low intensity fires. Its high susceptibility to fire is due to: thin bark; a moderate amount of resin in the bark; shallow roots (which are susceptible to soil heating); low branches; moderately flammable foliage; heavy fruticose lichen growth hanging from branches; generally dense stand structure; and high fuel loads in stands. Fire scars can allow fungal infections to occur. Seeds readily germinate on fire-prepared seedbeds where there is some shade from standing dead trees, logs or other vegetation. Regeneration is poor where shrubs and herbaceous cover is dense or where the remaining duff layer is too deep and seedlings roots cannot penetrate to moist mineral soil. Fire intervals are generally in excess of 150 yrs.

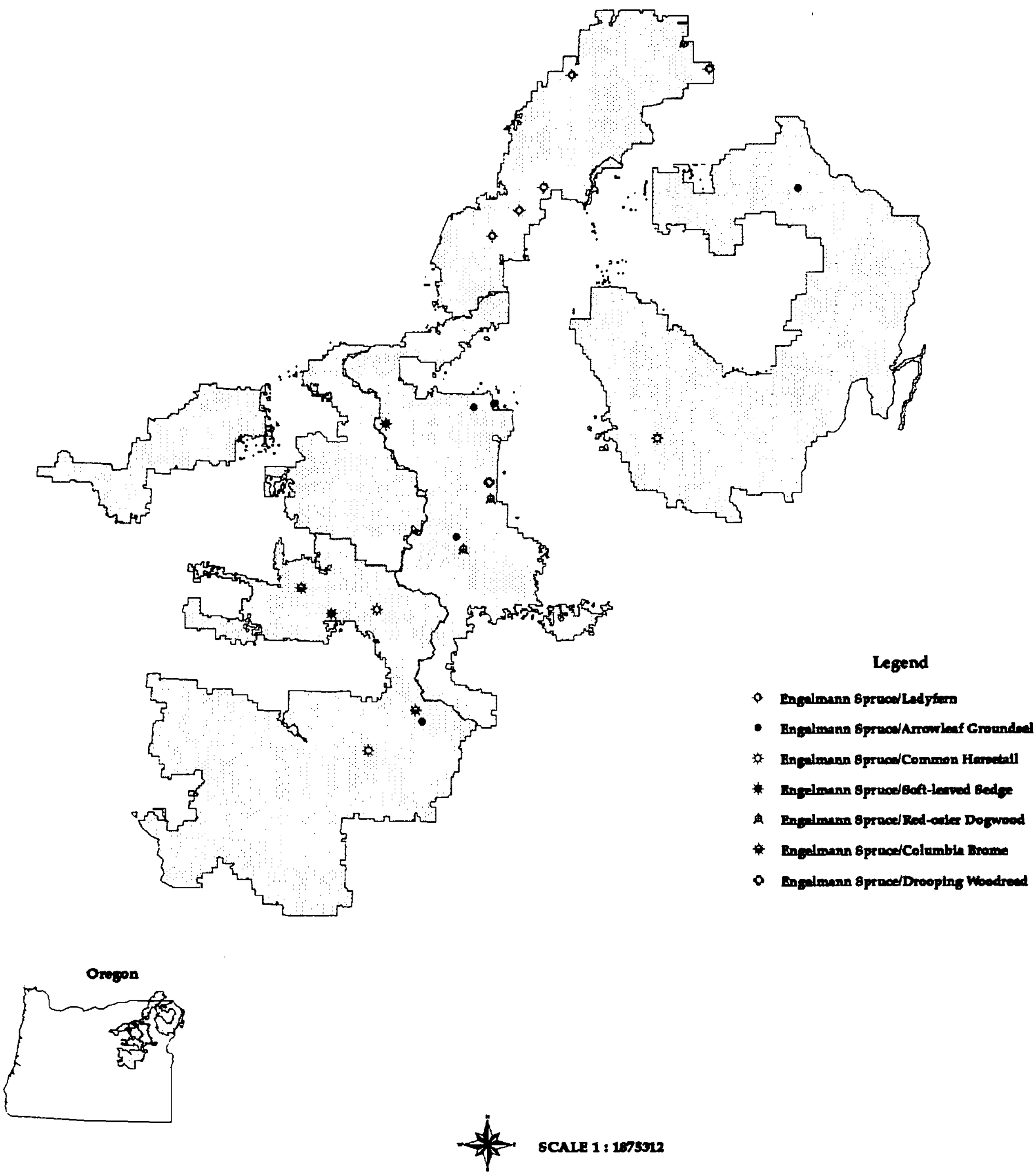
Birds that nest and feed in Engelmann spruce include: mountain chickadees, red-breasted nuthatches, Williamson's sapsuckers, brown creepers, owls and woodpeckers. Spruce grouse and blue grouse may feed extensively on buds and needles. Blue grouse use Engelmann spruce for cover and roosting. Squirrels sometimes clip twigs and bud, and seeds are eaten by small mammals. Palatability to livestock, deer and elk is low. Engelmann spruce stands provide excellent hiding cover, thermal cover, bedding sites and storm protection for deer, elk, bighorn sheep and bear as well as good year-round hiding cover for small animals. Snags used most often are > 11" dbh.

(Information taken from Alexander and Shepperd 1990 and Uchytil 1990b.)

Figure 6. Facing page
Sample sites for Engelmann spruce types. This map does not represent the actual distribution of Engelmann spruce types.

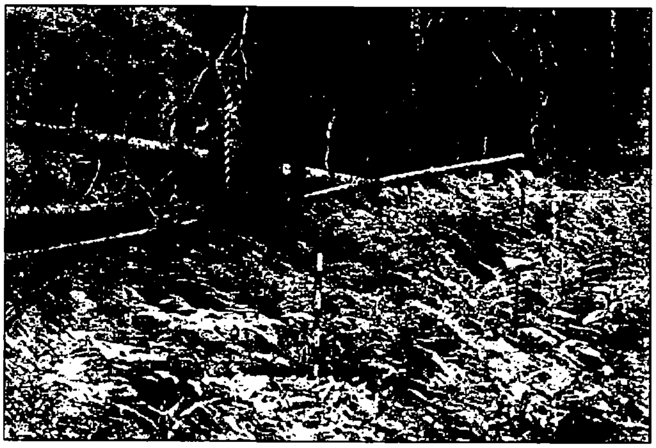
Engelmann Spruce Plant Associations,

Community Types & Communities



Engelmann Spruce/Lady Fern Plant Community Type

Picea engelmannii/Athyrium filix-femina CEF334
PIEN/ATFI n=5



PHYSICAL ENVIRONMENT

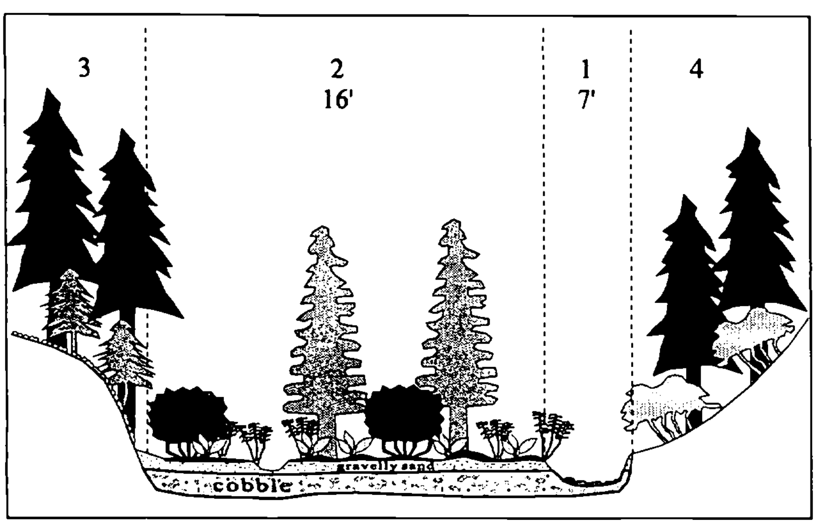
The Engelmann spruce/lady fern community type was found below the subalpine fir zone in the northern portion of the Umatilla National Forest (Walla Walla and Pomeroy RDs). Elevations ranged from 3300 to 4300 feet. Sites sampled were floodplains located in very narrow to narrow V-shaped valleys from 15 to 65 feet wide. Moderate to very high gradient (4%-10%) valleys were sampled. Soils generally consist of silt loam over sandy loam, gravel, cobbles, and stones. The mean thickness of the fine-textured material was 12 inches. These sites are seasonally flooded or saturated to the surface. The water table drops to 8-18 inches during the growing season. Adjacent streams are 5 to 30 feet wide and classified as A3, B3, C2 and C4 stream types.

Valley Environment	Mean	S.D.
Elevation (ft.)	3914	386
Plot Aspect (°)	30	62
Plot Slope (%)	5	3
Valley Width (m)	17	7
Valley Gradient (%)	6	2
Valley Aspect (°)	45	65
Soil Surface Cover (%)		
Submerged	3	7
Bare Ground	2	4
Gravel	1	2
Rock	1	2
Moss	46	24
Lichen	1	3
Litter	45	33

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt
Water Table Depth (cm)	18-21
Total Rooting Depth (cm)	13-40
Depth to Redoximorphic Features (cm)	15
Surface Layer	
Thickness (cm)	5-15
Texture(s)	histic organic, silt loam
Coarse Fragments (%)	0
Roots very fine: many	fine: many
medium: few to many	coarse: none to many
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	8-76
Texture(s)	silt loam, sandy loam
Coarse Fragments (%)	0-80, gravel
Roots very fine: many	fine: few to many
medium: few to many	coarse: few to many
Redoximorphic Features	some iron oxidation

Substrate sandy loam, gravel and cobble



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

Figure 7. *Coombs Creek, Pomeroy RD, Umatilla NF; very high gradient, mod. low elevation, V-shaped valley; Mesic Forest Zone 2.*

VEGETATION COMPOSITION

Principal Species		Con	Cov
Dominant Overstory Trees			
PIEN	Engelmann spruce	80	23
Subdominant Overstory Trees			
PIEN	Engelmann spruce	40	10
Understory Trees			
ABGR	Grand fir	60	1
PIEN	Engelmann spruce	20	2
Tall Shrubs			
RUPA	Western thimbleberry	100	4
RILA	Prickly currant	80	5
ALSI	Sitka alder	60	30
SYAL	Common snowberry	60	17
RIHU	Stinking currant	40	26
TABR	Pacific yew	40	4
Perennial Forbs			
STAM	Clasp-leaf twistedstalk	100	6
CIAL	Enchanter's nightshade	100	2
SAAR4	Brook saxifrage	100	1
GATR	Sweet-scented bedstraw	100	1
ANPI	Piper's anemone	100	tr
TITRU	Cool-wort foam-flower	80	11
MIPE	Alpine mitrewort	80	7
VIGL	Stream violet	80	4
HELA	Common cowparsnip	80	4
ACCO	Columbia monkshood	80	2
ANAR2	Sharptooth angelica	80	2
OSCH	Mountain sweet-cicely	80	1
ARCO	Heart-leaved miner's-lettuce	60	5
ACRU	Baneberry	60	4
SETR	Arrow-leaf groundsel	60	3
TRCA3	False bugbane	40	25
DIHO	Hooker's fairy-bells	40	10
Perennial Grasses			
CILA2	Drooping woodreed	100	3
BRVU	Columbia brome	60	4
Ferns and Horsetails			
ATFI	Lady fern	100	43
GYDR	Oak fern	40	33

Stands representing the PIEN/ATFI community are dominated by a scattered overstory of Engelmann spruce. Other conifers are scarce; only accidental grand fir occur in the understory. Western thimbleberry is a common shrub associate. Prickly currant, Sitka alder, and stinking currant 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 43%. Other important herbaceous species include clasp-leaf twistedstalk, enchanter's nightshade, brook saxifrage, sweet-scented bedstraw, cool-wort foam-flower, alpine mitrewort, stream violet, cowparsnip, heart-leaved miner's-lettuce, baneberry, false bugbane, and Hooker's fairy-bells. Oak fern'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. Upland vegetation types adjacent to sites sampled are: terraces - grand fir/Pacific yew/queen's cup beadlily; sideslopes - grand fir/Rocky Mountain maple, grand fir/Pacific yew/twinflower or queen's cup beadlily and other grand fir associations.

MANAGEMENT

Sites supporting the PIEN/ATFI type have a moderate climate in relation to the ABLA2/ATFI association, which occurs at relatively higher elevations upstream. Management of these narrow, wet fluvial surfaces, however, is similar to the colder subalpine fir sites. Engelmann spruce/lady fern stands provide shade, woody debris, and streambank stability for adjacent streams. Songbirds, squirrels, deer, elk, and bear use these streamside sites. Intensive timber production is limited on these small, wet areas.

Stand Characteristics

Species	*BA*	*Range*	*Site Index*	*Range*
PIEN	28	10-60	68	64-72

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Needle-leaved Evergreen, WATER REGIME (NONTIDAL) Seasonally Flooded to Saturated.

OTHER STUDIES

The Engelmann spruce/lady fern community type has not been described elsewhere.

Engelmann Spruce/Arrow-leaf Groundsel Plant Community Type

Picea engelmannii/Senecio triangularis CEF335
PIEN/SETR n=5

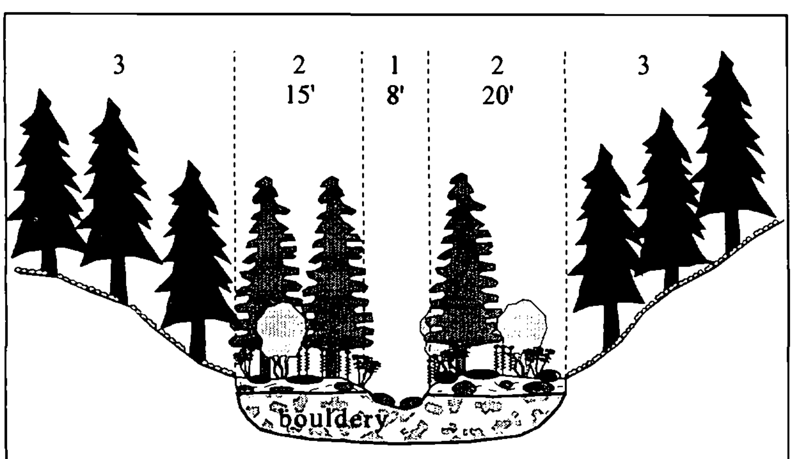
PHYSICAL ENVIRONMENT

The Engelmann spruce/arrow-leaf groundsel community type occurs in the northern and central portions of the study area (Hell's Canyon NRA, La Grande and Baker RDs, Wallowa-Whitman NF; Prairie City RD, Malheur NF). The PIEN/SETR type is found on mid-elevation bars, floodplains, and springs. Elevation ranges from 4800 to 5400 feet. Sampled sites are in very narrow to broad (5-1000 feet) and, generally, trough-shaped valleys. Valley gradients range from 1% to 8%. This plant community develops on coarse alluvial deposits of sand, gravel, cobbles, and boulders. Silt loam or sandy loam is usually deposited on top of these coarse layers. Mean depth to the water table is 10 inches 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 PIEN/ATFI community type has a mean coverage of 2% rock and gravel. Rosgen stream types of A2 and C3 are associated with sampled areas. Stream widths vary from 5 to 15 feet.

Valley Environment	Mean	S.D.
Elevation (ft.)	5096	257
Plot Aspect (°)	29	67
Plot Slope (%)	5	2
Valley Width (m)	73	89
Valley Gradient (%)	5	2
Valley Aspect (°)	42	67
Soil Surface Cover (%)		
Submerged	2	4
Bare Ground	3	3
Gravel	10	17
Rock	5	6
Bedrock	3	4
Moss	50	28
Liverwort	2	3
Litter	27	24

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, unknown sedimentary rocks and glacial moraine
Water Table Depth (cm)	10-58
Total Rooting Depth (cm)	23-25
Depth to Redoximorphic Features (cm)	10-13
Surface Layer	
Thickness (cm)	0-25
Texture(s)	silt loam, loam
Coarse Fragments (%)	0-30, boulders
Roots	very fine: none to many; fine: common to many; medium: none to many; coarse: none to few
Redoximorphic Features	none



1 A2 stream reach
2 **Engelmann spruce/arrowleaf groundsel**, banks and floodplain
3 Grand fir/twinflower, north- and south-facing sideslopes

Figure 8. *McCully Fork, Baker RD. Wallowa-Whitman NF; mod.. steep, mod. high elevation, trough-shaped valley; Mesic Forest Zone 1.*

Subsurface Layer(s)

Thickness (cm)	0-33
Texture(s)	sapric organic, medium sandy loam, coarse sandy loam
Coarse Fragments (%)	0-30, boulders
Roots very fine: common to many	fine: few to many
medium: few to many	coarse: few
Redoximorphic Features	some iron oxidation and gleying
Substrate	gravel, cobble, boulders

VEGETATION COMPOSITION

Principal Species		Con	Cov
Dominant Overstory Trees			
PIEN	Engelmann spruce	80	26
Subdominant Overstory Trees			
PIEN	Engelmann spruce	60	9
Understory Trees			
ABGR	Grand fir	80	3
PIEN	Engelmann spruce	40	18
Tall Shrubs			
RILA	Prickly currant	100	12
ALIN	Mountain alder	80	35
RIHU	Stinking currant	80	12
COST	Red-osier dogwood	60	6
ROGY	Bald-hip rose	40	11
Perennial Forbs			
SETR	Arrow-leaf groundsel	100	3
GATR	Sweet-scented bedstraw	100	4
ACCO	Columbia monkshood	100	3
PYSE	Side-bells pyrola	100	1
SAAR4	Brook saxifrage	80	4
STAM	Clasp-leaf twistedstalk	80	3
VEAM	American speedwell	80	2
PAFI	Rocky Mountain grass-of-Parnassus	80	2
MIPE	Alpine mitrewort	80	1
GEMA	Large-leaf avens	80	1
MOCO	Heart-leaved miner's-lettuce	60	9
HELA	Common cowparsnip	60	3
ANAR2	Sharptooth angelica	60	3
OSCH	Mountain sweet-cicely	60	2
THOC	Western meadowrue	60	2
ASMO	Great north aster	40	4
CLUN	Queen's cup beadlily	40	3
VIGL	Stream violet	40	3
CIAL	Enchanter's nightshade	40	2
RAUN2	Wood buttercup	40	2
Perennial Grasses			
CILA2	Drooping woodreed	80	5
BRVU	Columbia brome	80	2
Sedges and Rushes			
CADI	Soft-leaved sedge	40	5

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 a common shrub associate. Mountain alder, stinking currant, red-osier dogwood, and bald-hip rose are frequent understory shrubs. These plots appear to be in transition from the ALIN-RIBES/MESIC FORB plant association. The diverse understory is characterized by the wet-site forb, arrow-leaf groundsel, with mean canopy coverage of 38%. Other important forbs include sweet-scented bedstraw, Columbia monkshood, brook saxifrage, clasp-leaf twistedstalk, American speedwell, Rocky Mountain grass-of-Parnassus, heart-leaved miner's-lettuce, cowparsnip, sharptooth angelica, mountain sweet-cicely, and western meadowrue. Frequent grass and sedge components include drooping woodreed, Columbia brome, and soft-leaved sedge. Upland vegetation types adjacent to sites sampled are: terraces - Englemann spruce (subalpine fir)/ twinflower, sideslopes - grand fir/grouse huckleberry, grand fir/pinegrass, grand fir/twinflower and bluebunch wheatgrass-Sandberg's bluegrass.

MANAGEMENT

Sites supporting the PIEN/SETR community type have limited potential for intensive timber management because of the small, narrow stands and associated wet soils. Deer, elk, songbirds, bear, and small mammals use these areas. Fish habitat in adjacent streams is maintained through shade, streambank stability, and woody debris provided by vegetation of the PIEN/SETR type.

Stand Characteristics

Species	*BA*	*Range*	*Site Index*	*Range*
PIEN	48	20-100	39	37-41

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Needle-leaved Evergreen, WATER REGIME (NONTIDAL) Seasonally Flooded to Saturated.

OTHER STUDIES

The PIEN/SETR community type has not been described elsewhere, but it represents elements of PIEN/EQAR defined by Pfister and others (1977), Steele and others (1983), and Mauk and Henderson (1984).

Miscellaneous Engelmann Spruce Types

Engelmann Spruce/Common Horsetail Plant Association

Picea engelmannii/Equisetum arvense CEM211
PIEN/EQAR n=3

The PIEN/EQAR habitat type has been described in central Idaho (Steele and others 1981), eastern Idaho-western Wyoming (Steele and others 1983), Montana (Pfister and others 1977, Hansen and others 1995), northern Utah (Mauk and Henderson 1984), eastern Washington (Kovalchik 1992), and central Oregon (Kovalchik 1987). It is represented in this classification by three sites located in the central Blue Mtns. (Long Creek and Prairie City RD, Malheur NF; La Grande RD, Wallowa-Whitman NF). Soils are variable: a histosol in the wet basin site and mineral soils on the two floodplain sites. The water table depth at the time of sampling varied from 28-51 cm below the soil surface. Elevation ranges from 4400-5460 feet. Adjacent stream reach types are B4c and C4. Engelmann spruce (PIEN) is the climax dominant in the overstory. Minor amounts of Sitka alder (ALSI), common snowberry (SYAL), and prickly currant (RILA) were present in the shrub understory. The herbaceous layer supports a varied group of wet-site forbs, grasses, sedges, and common horsetail (EQAR). Alpine mitrewort (MIPE), starry false-Solomon's seal (SMST), sharptooth angelica (ANAR2), brook saxifrage (SAAR4), common monkey-flower (MIGU), tall mannagrass (GLEL) and soft-leaved sedge (CADI) are important understory members. Moss cover varied from 0 to 50%. Sites supporting the Engelmann spruce/common horsetail plant association provide wildlife habitat for beaver, woodpeckers, songbirds, deer, and elk. Timber management potential is low due to the silvicultural and operational constraints of the wet site.

Engelmann Spruce/Soft-leaved Sedge Plant Association

Picea engelmannii/Carex disperma CEM121
PIEN/CADI n=2

The Engelmann spruce/soft-leaved sedge plant association was sampled on La Grande RD (Wallowa-Whitman NF). It occurs on streambanks and floodplains from 4900 to 5400 feet in elevation. Landforms are V-shaped, low to high gradient valleys 15 to 200 feet wide. Soils are derived from fine and coarse textured alluvium. The sites are flooded early in the spring with the water table retreating to 2-3 feet below the surface in August. Adjacent stream reach types are B4 and B5. Late seral and climax stands are dominated by Engelmann spruce (PIEN), and lodgepole pine (PICO) is the principal seral tree species. Mountain alder (ALIN) can be abundant in early seral stands before trees establish dominance. Soft-leaved sedge (CALA) and tall mannagrass (GLEL) are prominent understory components. Common forbs include starry false-Solomon's seal (SMST), Rocky Mountain grass-of-Parnassus (PAFI), brook saxifrage (SAAR4), and heart-leaved miner's-lettuce (MOCO). The PIEN/CADI type provides important nesting sites for MacGillivray's warblers, American robins and warbling vireos (Uchytil, 1991b). Adjacent upland vegetation types are: grand fir/twinflower and grand fir/ big huckleberry. This type has been described by Steele and others (1981) for central Idaho and Steele and others (1983) for eastern Idaho and western Wyoming.

Engelmann Spruce/Red-osier Dogwood Plant Association

Picea engelmannii/Cornus stolonifera CES511
PIEN/COST n=2

This plant association has been described by Padgett and others (1989) in southeastern Idaho, Hansen and others (1995) in Montana, and Kovalchik (1992) in eastern Washington. In our area it was found in narrow, V-shaped and trough-shaped valleys at 4600-5550 feet elevation on Baker RD (Wallowa-Whitman NF). Adjacent stream reach types are B3 and B4. The tree layer is dominated by Engelmann spruce (PIEN) in the overstory and understory. Lodgepole pine (PICO), subalpine fir (ABLA2), and grand fir (ABGR) occurred rarely. A dense shrub layer, composed of red-osier dogwood (COST), mountain alder (ALIN), prickly currant (RILA), and stinking currant (RIHU), had over 90% canopy coverage. Important herbs include: sidebells pyrola (PYSE), sweet-scented bedstraw (GATR), asters (ASTER), nodding fescue (FESU), blue wildrye (ELGL), drooping woodreed (CILA2), and panicled bulrush (SCMI). Adjacent upland vegetation types are: lodgepole pine(subalpine fir)/grouse huckleberry, grand fir/big huckleberry and Douglas-fir/pinegrass. Stands supporting the PIEN/COST association provide for the maintenance of watershed values and for wildlife habitat.

Engelmann Spruce/Columbia Brome Plant Community Type

Picea engelmannii/Bromus vulgaris
PIEN/BRVU n=3

Three sites in the central Blue Mountains (Prairie City and Long Creek RDs, Malheur NF; Baker RD, Wallowa-Whitman NF) between 4700 and 5800 feet represent this community type. The PIEN/BRVU occurs on floodplains and terraces in high gradient, narrow, V-shaped valleys. Stream reach types are A4, B2 and B3a. Engelmann spruce (PIEN) is the tree dominant with lodgepole pine (PICO) and western larch (LAOC) present as seral overstory components. Grand fir (ABGR) presence may indicate potential on these sites. The understory is dominated by Columbia brome (BRVU). Associated species include heartleaf arnica (ARCO), trail plant (ADBI), queen's cup beadlily (CLUN), western meadowrue (THOC), prickly currant (RILA), mountain alder (ALIN), big huckleberry (VAME), stinking currant (RIHU), American twinflower (LIBO2), and grouse huckleberry (VASC). Adjacent upland vegetation types are: lodgepole pine(grand fir)/grouse huckleberry, grand fir/big huckleberry, grand fir/grouse huckleberry and subalpine fir/twinflower. This type may represent successional communities of moist grand fir plant associations such as ABGR/CLUN, ABGR/LIBO2, and ABGR/BRVU (Clausnitzer 1993, Johnson and Clausnitzer 1992).

Engelmann Spruce/Drooping Woodreed Plant Community

Picea engelmannii/Cinna latifolia
PIEN/CILA2 n=1

One plot was located in an Engelmann spruce/drooping woodreed stand on a gentle floodplain in the Elkhorn Mountains (Baker RD, Wallowa-Whitman NF) at 5400 feet elevation. The adjacent stream reach was a B2 type. Mortality was prominent in mature spruce with about one-third of the stems recently dead. Blowdown was abundant further upstream in the drainage. Elk use of the area was heavy. Shrubs are scarce. Cool-wort foam-flower (TITRU) and heart-leaved miner's-lettuce (MOCO) are well represented. Drooping woodreed (CILA2) dominates the understory with 95% cover. While PIEN/CILA2 was sampled in only one drainage, it may have wider distribution in the central and northern Blue Mountains.

General Management Considerations for Lodgepole Pine

Lodgepole pine *(Pinus contorta)* grows under a wide variety of climatic conditions. Minimum temperatures range from -70° to 45° F and maximum temperatures range from 80° to 100° F. Average July minimum temperatures are frequently below freezing at high elevations. Lodgepole pine seedlings are relatively resistant to frost and often survive in frost pockets where other species do not. The riparian and meadow lodgepole pine associations and community types described on the following pages generally occur in cold air drainages (where frequent frosts occur) in the interior Blue Mountains. On drier sites snowfall supplies most of the soil water used for rapid growth in early summer. Lodgepole pine trees can begin producing cones and viable seeds at 5-10 yrs. of age. This species is a prolific seed producer and the germination percentage of seeds is high. Cones can withstand freezing temperatures and are generally not affected by cone- and seed-feeding insects, although squirrels may harvest a large amount of cones and seeds. Lodgepole pine produces both serotinous and non-serotinous cones. Serotinous cones remain closed at maturity by a resinous bond between the cone scales. Temperatures between 113° and 140° F will break the bonds in the resin and allow the cones to open hygroscopically. Serotinous cones may remain on a tree for many years only to open following a fire, or they may fall from the tree and receive adequate insolation on the soil surface to open and disperse seeds. Most of the lodgepole pine in the Blue Mountains produce non-serotinous cones. Flowers are pollinated from May to July, and seeds are dispersed from August to October of the following year. Seeds can be transported by prevailing winds or scudding of seeds across the snow. Seedlings germinate best in full sunlight (in air temperatures between 47° and 78° F) on bare mineral soil, disturbed duff or organic soil that is free of competing vegetation. There must be adequate soil moisture for seeds to germinate and for seedlings to survive the first few weeks. The wetter lodgepole pine associations, i.e. lodgepole pine/aquatic sedge, lodgepole pine/woolly sedge, lodgepole pine/mountain alder/mesic forb and lodgepole pine/bluejoint reedgrass, would rarely present a moisture deficit problem for seed germination and seedling development. In these associations seedlings establish best on fresh flood deposits, rotting logs or soil mounds surrounding root wads on windthrow trees. The root system is generally shallow, especially where the water table is high. Lodgepole pine requires less water than Engelmann spruce and subalpine fir. Seedlings can grow very rapidly if they are well spaced.

Mountain pine beetle *(Dendroctonus ponderosae)* is the most damaging insect for lodgepole pine. Other important damaging organisms include the pine engraver *(Ips pini)*, dwarf mistletoe and fungal pathogens.

Lodgepole pine trees are susceptible to all but light intensity surface fires. They have thin bark and often grow in dense stands. Crown scorch and cambial heating by surface fires will kill trees. Trees injured but not killed by fire are susceptible to some insects and decay fungi. After fires lodgepole pine reestablishes by seed; the most successful establishment occurs where more mineral soil is exposed. Serotinous cones, even if scarce in a population, can provide a tremendous amount of seeds.

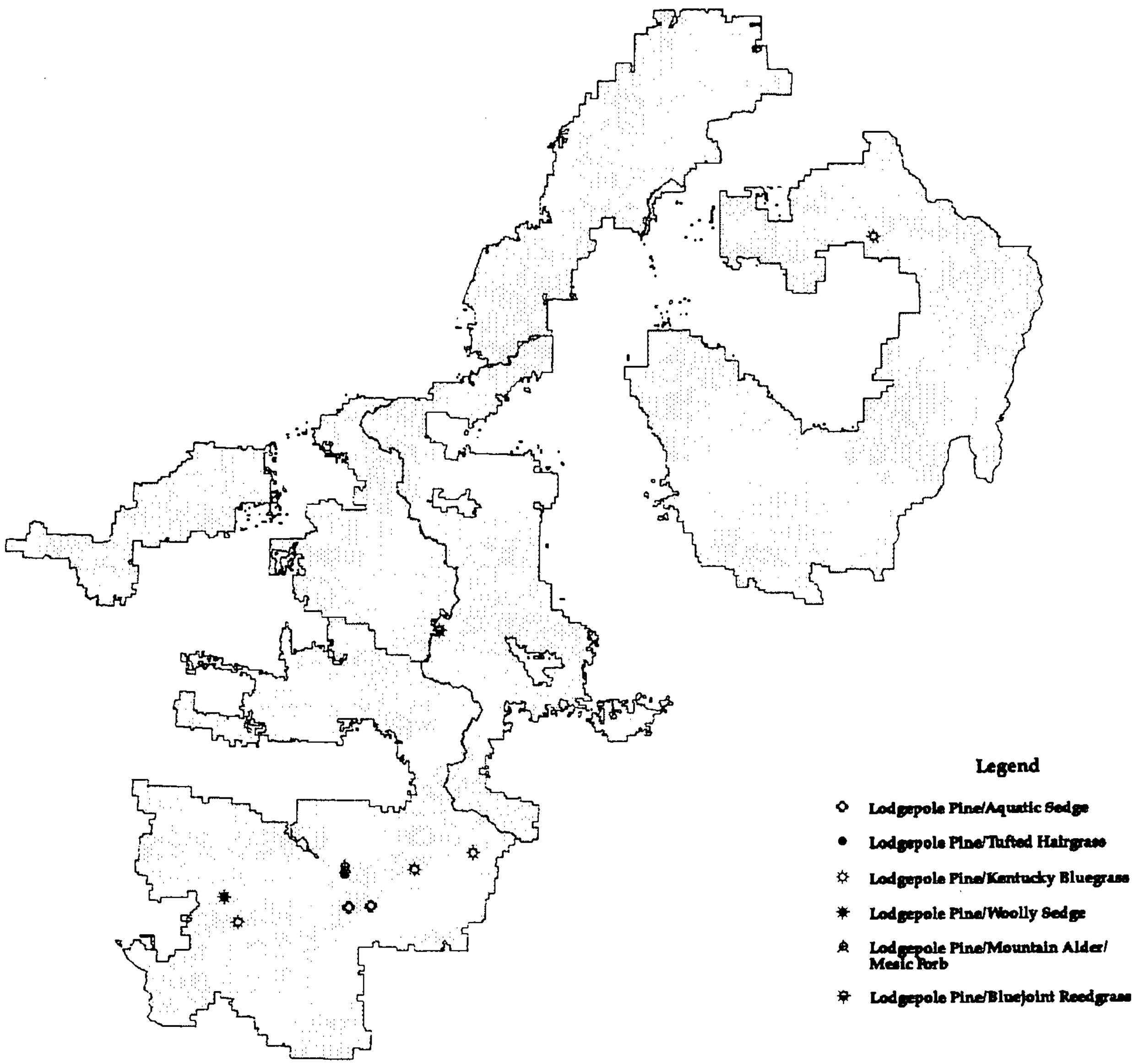
Lodgepole pine stands provide excellent cover for deer, elk, bear, small mammals and nongame birds. The trees are important seed sources for pine squirrels. Chipmunks and songbirds also eat seeds. The needles are important winter food for spruce grouse and blue grouse. Wild ungulates seldom browse lodgepole pine foliage. It has low palatability to livestock, although domestic sheep may occasionally browse branch ends.

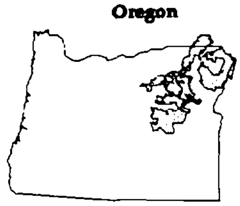
(Information taken from Lotan and Critchfield 1990 and Uchytil 1992.)

Figure 9. Facing page
Sample sites for lodgepole pine types. This map does not represent the actual distribution of lodgepole pine types.

Lodgepole Pine Plant Associations,

Community Types & Communities





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Lodgepole Pine Types

Lodgepole Pine/Aquatic Sedge Plant Association

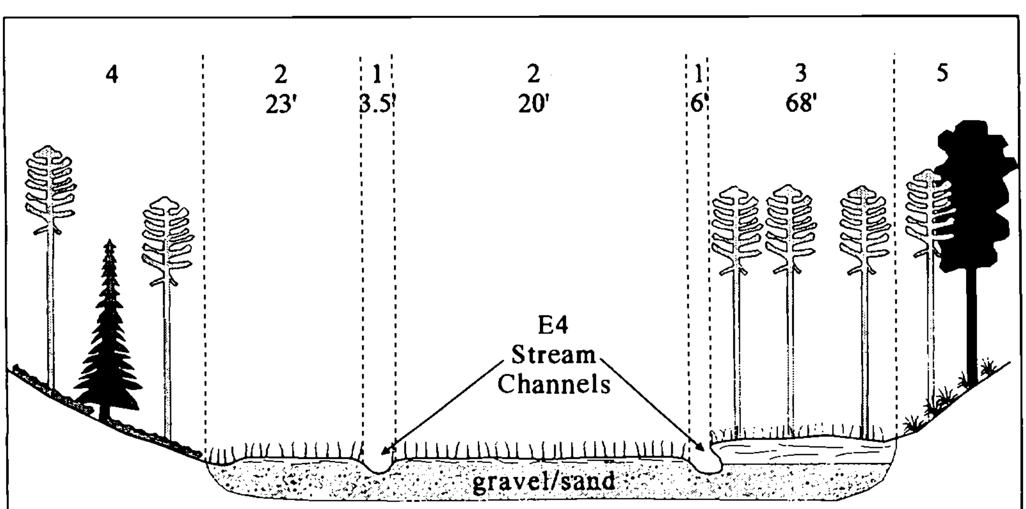
Pinus contorta/Carex aquatilis CLM114
PICO/CAAQ n=2

The PICO/CAAQ association was found on the Burns RD (Malheur NF) from 5000 to 5300 feet elevation. Two plots were located in low gradient, V-shaped valleys 60 to 200 feet wide. Sampled sites were associated with floodplains or with springs on stream terraces. The E4 stream reach type was identified at both sites. Soils are composed of silt loam and sandy loam. A 4-inch deep sedge peat layer occurred on the soil surface at the sampled spring. Depth to the water table was 18-30 inches in June-July. Lodgepole pine (PICO) is the singular climax tree species. The shrub layer is depauperate while the herb layer consists of a dense sward of aquatic sedge (CAAQ). Commonly associated species include soft-leaved sedge (CADI), field woodrush (LUCAM), tufted hairgrass (DECE), large-leaf avens (GEMA), Jeffrey's shooting-star (DOJE), streambank butterweed (RAUN2), yarrow (ACMI), and Northwest cinquefoil (POGR). Aquatic sedge is palatable to livestock and overuse results in communities of Kentucky bluegrass (POPR), strawberry (FRAGE), butterweed (SENEC), and cinquefoil (POTEN). Adjacent upland vegetation types are: lodgepole pine(grand fir)/ grouse huckleberry/pinegrass, grand fir/grouse huckleberry, grand fir/grouse huckleberry-twinflower and Douglas-fir/elk sedge (upper slopes). Sites supporting the PICO/CAAQ association provide habitat for deer, elk, and raptors in addition to providing watershed protection. This plant association is described by Kovalchik (1987) for central Oregon.

Lodgepole Pine/Tufted Hairgrass Plant Association

Pinus contorta/Deschampsia cespitosa CLM115
PICO/DECE n=1

A streamside terrace at 4900 feet elevation on the Bear Valley RD (Malheur NF) supported a community of lodgepole pine (PICO) with tufted hairgrass (DECE) dominant in the understory. The site is located in a broad, low gradient, flat-shaped valley adjacent to an E5 stream reach. It borders streamside and wet meadow vegetation of willows and sedges. The soil consists of silt loam and was seasonally wet to within a foot of the surface but with the water table retreating to 2.5 feet by mid-June. Western meadowrue (THOC), broad-petal strawberry (FRVI), Baltic rush (JUBA), and Kentucky bluegrass (POPR) are important understory species. The adjacent upland vegetation type is: lodgepole pine-ponderosa pine (grand fir?)/pinegrass. This type provides habitat for deer, elk, beaver, raptors, and songbirds. Kovalchik (1987) describes a similar miscellaneous type for central Oregon.



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

Figure 10. *Summit Creek, Prairie City RD, Malheur NF; very low gradient, mod.. high elevation, flat-shaped valley; Continental Zone*

Lodgepole Pine/Woolly Sedge Plant Community

Pinus contorta/Carex lanuginosa
PICO/CALA3 n=1

This type was sampled in a spring along Scotty Creek on the Malheur National Forest (Bear Valley RD). The site is in a moderate gradient, trough-shaped valley at 5100 feet elevation. The adjacent stream reach is E5. The soil is composed of sedge peat, sandy loam, gravel, and cobbles. The water table was at the surface in early June. Lodgepole pine (PICO) is represented in all age classes on the site; other conifers are rare. Woolly sedge (CALA3) dominates the herbaceous understory with 70% coverage. Important forbs include bog saxifrage (SAOR), long-stalked clover (TRLO), sharptooth angelica (ANAR2), and stream butterweed (RAUN2). The relationship of this community in the lodgepole pine series is currently undetermined.

Lodgepole Pine/Mountain Alder/Mesic Forb Plant Community

Pinus contorta/Alnus incana/Mesic forb
PICO/ALIN/MESIC FORB n=1

One plot established in the Bear Valley Ranger District (Malheur NF) represents streamside habitats in which lodgepole pine (PICO) mixes with mountain alder (ALIN) on floodplains.This site is located at 5000 feet elevation in a low gradient, moderate width, V-shaped valley. The adjacent stream reach is C4. The soil is composed of 8 inches of loam over gravel and cobbles. This type may represent a situation where lodgepole pine has entered an ALIN-RIBES/MESIC FORB site. Thus the site may be changing potential. Associated species include big-leaf sandwort (ARMA3), long-stalked clover (TRLO), broad-leaf bluebells (MEPA), sweet-scented bedstraw (GATR), meadow arnica (ARCH), drooping woodreed (CILA2), and Kentucky bluegrass (POPR).

Lodgepole Pine/Bluejoint Reedgrass Plant Community

Pinus contorta/Calamagrostis canadensis
PICO/CACA n=1

One plot located on the North Fork RD (Umatilla NF) is dominated by lodgepole pine (PICO) with bluejoint reedgrass (CACA) in the understory. Sitka burnet (SASI2), swamp onion (ALVA), American twinflower (LIBO2), and bog birch (BEGL) are prominent understory members. This site is in a streamside seep at 4800 feet elevation. The soil is composed of organic-rich loam. Mauk and Henderson (1984) describe a similar community type in northern Utah as successional to the ABLA2/CACA habitat type. The PICO/CACA community represents early successional stands of that same plant association in our study area.

Lodgepole Pine/Kentucky Bluegrass Plant Community Type

Pinus contorta/Poa pratensis CLM112
PICO/POPR n=4

Four disturbed stream terraces on the Malheur (Prairie City and Bear Valley RDs) and Wallowa-Whitman (WallowaValley RD) National Forests were sampled to portray the lodgepole pine/Kentucky bluegrass community type. Elevations ranged from 4400-5200 ft. Valleys in which this type was sampled were V- or flat-shaped and 60-200 ft. wide with gentle gradients. Adjacent stream reach types were E3, E4, C4 and F4. Bluegrass coverage ranges from 70-90%. Important forbs are broad-petal strawberry (FRVI), yarrow (ACMI), Northwest cinquefoil (POGR), thistle (CIRSI), common dandelion (TAOF), common self-heal (PRVU), and common timothy (PHPR). These forbs are promoted by ground disturbance and overuse by grazing animals. Continued overuse can lead to dominance by Baltic rush (JUBA), invasive forbs, and annual forbs (Kovalchik 1992). Adjacent upland vegetation types are: lodgepole pine/pinegrass, ponderosa pine/common snowberry, lodgepole pine-ponderosa pine(grand fir?)/pinegrass, subalpine fir/grouse huckleberry and Douglas fir/mallow ninebark. The PICO/POPR community type provides forage and cover for domestic livestock, deer, and elk as well as habitat for raptors (Kovalchik 1992). Rehabilitation must consider hydrology of these sites in addition to the difficulty of replacing Kentucky bluegrass. Restoration of the water table to natural levels must precede efforts to change vegetation composition. Subsequently, a series of late spring burns may eliminate Kentucky bluegrass (Uchytil 1993).

General Management Considerations for Grand Fir

Grand fir *(Abies grandis)* is found in the Blue Mountains where average annual temperatures range from 43° to 50° F. Average annual precipitation ranges from 14 to 39 in. and average elevation ranges from 2000 to 5000' (although trees may grow from 1500-6000'). Trees can begin seed production at around 20 yrs. of age. Production increases with age and with increasing diameter and vigor of trees. Flowering occurs from late March to June and cones ripen in August and September. Seeds are dispersed one month later by wind and rodents. Germination occurs the following spring on mineral soil or duff. Stratification under cool (34° to 41°F), moist conditions speeds germination. About 30% of seedlings die in the first season, principally from damping-off diseases, excess insolation and drought. Seedlings are relatively resistant to heat injury. On heavily shaded, cool sites, drought is the most important physical cause of seedling death because of slow initial root penetration. Seedlings grow anchoring taproots more rapidly and deeply than Engelmann spruce. Trees are very shade tolerant. They commonly reach heights of 115-151 ft. at 250 yrs. of age.

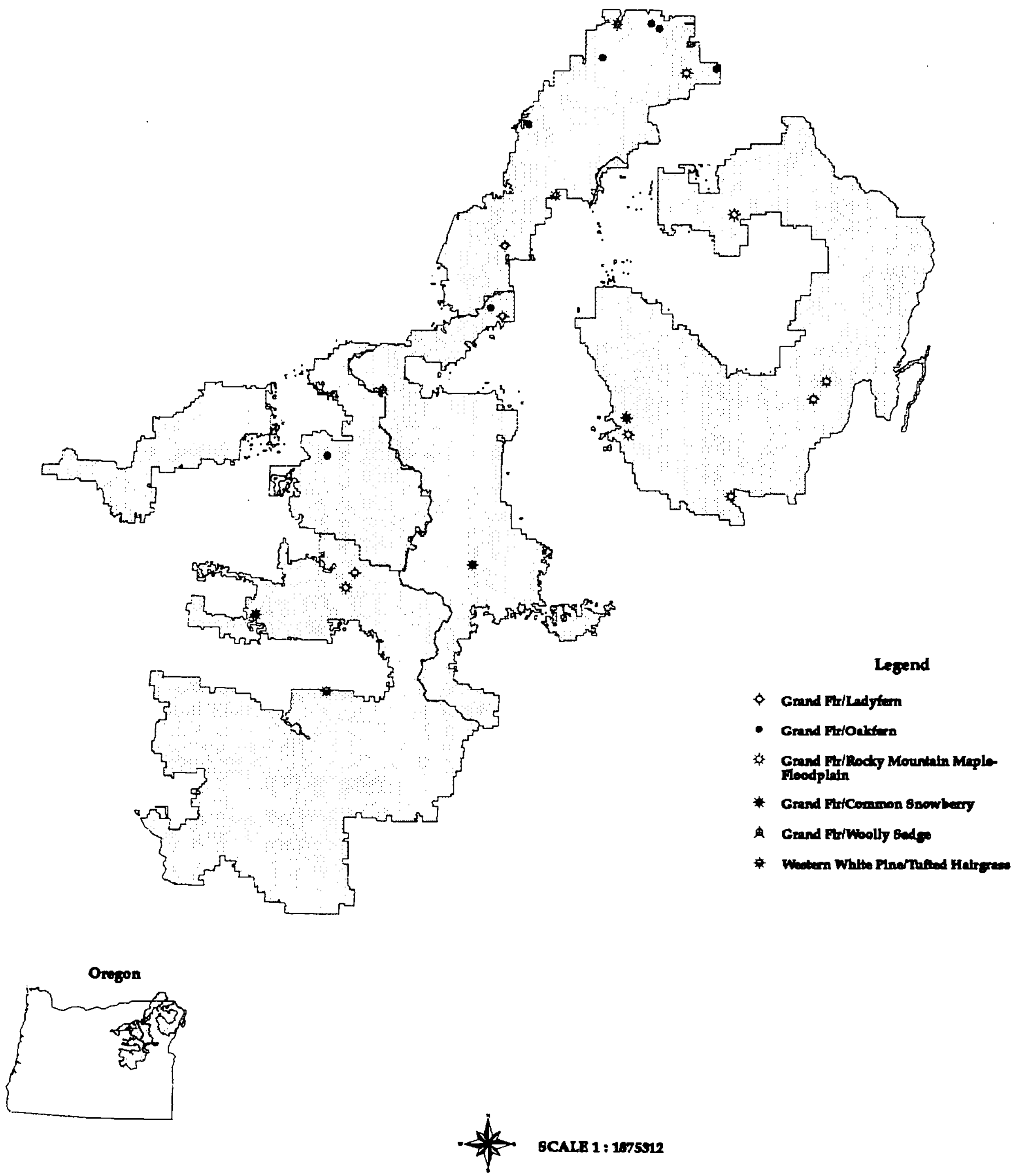
Grand fir is susceptible to heart rot and decay diseases, including Indian paint fungus, spongy rot, butt rots, laminated root rot, stringy butt rot and white spongy rot. It also can be parasitized by white fir dwarf mistletoe. Insects that damage grand fir are western spruce budworm, Douglas-fir tussock moth, western balsam bark beetle, fir engraver, fir cone moth, fir cone maggot and seed chalcids.

Grand fir is more fire resistant than subalpine fir, Engelmann spruce and lodgepole pine, but less resistant than western larch, ponderosa pine and Douglas-fir. Several characteristics of the species make it susceptible to fire, including: dense, low branches; flammable foliage; heavy fruticose lichen growth hanging from branches; and relatively shallow roots. Seedlings are easily killed until they are 4 in. dbh. Mature trees have 2 in. thick bark that protects them against low to moderately severe fires, but if they are injured, they become susceptible to Indian paint fungus. On moist grand fir sites, fire return intervals range from 70-250 yrs. The more infrequent fires are extreme, stand-replacing fires. Trees on moist sites succumb rapidly to surface fires because their bark is thinner and they have shallower root systems than trees growing on drier sites. Grand fir seeds can regenerate burned areas, but the seeds have short viability periods. Thus, regeneration can be delayed for several years if conditions are not good for germination.

Grand fir needles are a major part of the diet of grouse. Deer and elk may also eat the needles in winter. Birds and small mammals eat the seeds. Grand fir stands provide good thermal and hiding cover for deer and elk and are good nesting and roosting sites for birds. Young trees are good cover for small animals and gamebirds, especially in the winter. Old, rotton trees and snags provide nesting and feeding sites for cavity nesters, martens, fishers, squirrels, weasels and deer mice. (Information taken from Foiles and others 1990 and Crane 1991.)

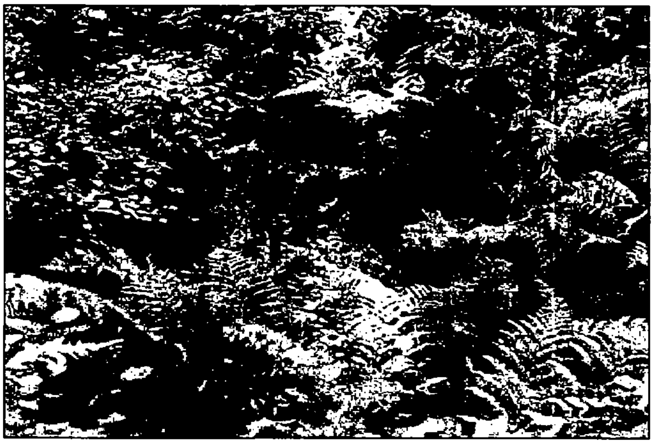
Figure 11. Facing page
Sample sites for grand fir types. This map does not represent the actual distribution of grand fir types.

Grand Fir Plant Associations, Community Types & Communities



Grand Fir/Lady Fern Plant Association

Abies grandis/Athyrium filix-femina CWF613
ABGR/ATFI n=4



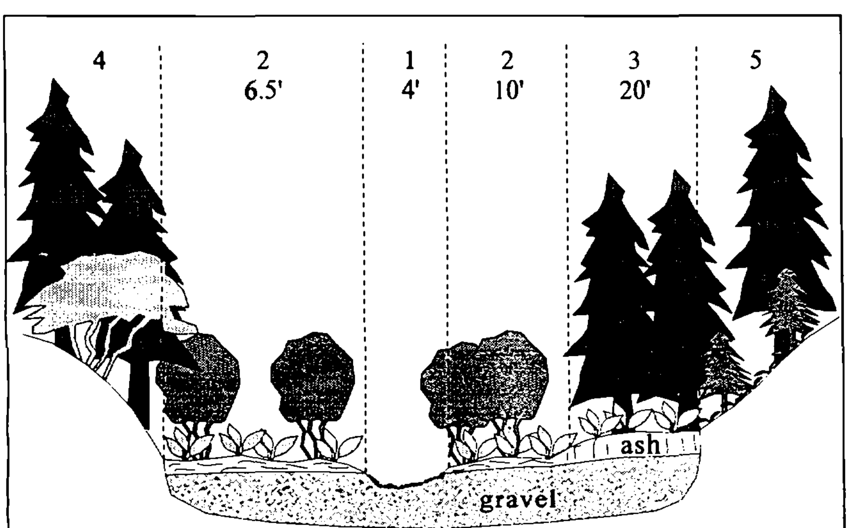
PHYSICAL ENVIRONMENT

Sampled plots were located on Walla Walla and Pomeroy RDs (Umatilla NF) and Long Creek RD (Malheur NF). These sites are associated with streambanks and floodplains between 3200 and 5200 feet elevation. V-shaped, low to very high gradient valleys (2%-10%), 15 to 60 feet wide are characteristic of this type. Soils are composed of silt loam or silty clay loam over gravel and cobbles. Mean depth to the buried stream bed is 10 inches. Spring flooding of these sites is followed by the water table retreating 1-2 feet by fall. Rosgen stream reach types of B3 and B4 were identified.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4445	564
Plot Aspect (°)	136	70
Plot Slope (%)	12	12
Valley Width (m)	13	9
Valley Gradient (%)	7	4
Valley Aspect (°)	192	62
Soil Surface Cover (%)		
Submerged	2	4
Bare Ground	2	2
Gravel	1	1
Rock	3	5
Moss	21	33
Litter	71	33

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, mixed- predominantly igneous extrusive
Total Rooting Depth (cm)	25-46
Surface Layer	
Thickness (cm)	5-17
Texture(s)	silt loam, clay loam
Coarse Fragments (%)	0-2, gravel
Roots very fine: few to many; medium: none to few	fine: common to many; coarse: none to few
Redoximorphic Features	none
Surface Layer	
Thickness (cm)	0-28
Texture(s)	silt loam
Coarse Fragments (%)	0
Roots very fine: few; medium: few	fine: few; coarse: few
Redoximorphic Features	none
Substrate	gravel, cobble



1 B4 stream reach
2 **Mountain alder/ladyfern,** floodplain
3 **Grand fir/ladyfern,** terrace
4 Grand fir/Rocky Mtn. maple, southwest-facing sideslope
5 Grand fir/big huckleberry, northeast-facing sideslope

Figure 12. *Dry Creek, Walla Walla RD, Umatilla NF; mod. low gradient, mod. low elevation, V-shaped valley; Mesic Forest Zone 1.*

VEGETATION COMPOSITION

Principal Species		Con	Cov
Dominant Overstory Trees			
PIEN	Engelmann spruce	25	25
ABGR	Grand fir	25	15
Subdominant Overstory Trees			
ABGR	Grand fir	50	40
Understory Trees			
ABGR	Grand fir	75	5
PIEN	Engelmann spruce	75	3
Tall Shrubs			
RILA	Prickly currant	75	4
ALSI	Sitka alder	50	37
ALIN	Mountain alder	50	15
ACGL	Rocky Mountain maple	50	2
Perennial Forbs			
MIPE	Alpine mitrewort	100	12
STAM	Clasp-leaf twistedstalk	100	9
CIAL	Enchanter's nightshade	100	4
RUOC	Western coneflower	100	2
TITRU	Cool-wort foam-flower	75	19
MOCO	Heart-leaved miner's-lettuce	75	8
URDI	Stinging nettle	75	3
SAAR4	Brook saxifrage	75	3
ADBI	Trail plant	75	2
RAUN2	Wood buttercup	75	1
GATR	Sweet-scented bedstraw	75	1
ACCO	Columbia monkshood	75	1
SMST	Starry false-Solomon's seal	50	7
DIHO	Hooker's fairy-bells	50	3
OSCH	Mountain sweet-cicely	50	3
TRCA3	False bugbane	50	3
VIGL	Stream violet	50	3
EPGL2	Common willow-herb	50	2
CACO2	Large mountain bittercress	50	2
THOC	Western meadowrue	50	2
Perennial Grasses			
CILA2	Drooping woodreed	100	6
BRVU	Columbia brome	50	2
Ferns and Horsetails			
ATFI	Lady fern	100	5

Grand fir dominates the multi-storied tree layer in climax stands. Engelmann spruce is occasionally abundant as a late-seral overstory 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, clasp-leaf twistedstalk, enchanter's nightshade, western coneflower, cool-wort foam-flower, heart-leaved miner's-lettuce, stinging nettle, brook saxifrage, trail plant, starry false-Solomon's seal, drooping woodreed, and Columbia brome. Upland vegetation types adjacent to sites sampled are: sideslopes - grand fir/Pacific yew/twinflower or queen's cup beadlily, grand fir/big huckleberry, grand fir/Rocky Mountain maple and grand fir/queen's cup beadlily.

MANAGEMENT CONSIDERATIONS

The ABGR/ATFI plant association occurs on narrow, wet streambanks and floodplains not suitable for intensive timber production. Streamside stands enhance and maintain watershed values and fish habitat by shading streams, providing woody debris, and stabilizing streambanks. Wildlife use by small mammals, birds, and wild ungulates is moderate. Lady fern has low forage value (Walkup 1991a) but the associated shrubs are browsed by deer and elk. In addition, these streamside sites provide summer thermal cover for wildlife.

Stand Characteristics

Species	*BA*	*Range*	*Site Index*	*Range*
ABGR	25	20-40	69	—
PIEN	20	—	64	30-98

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Needle-leaved Evergreen, WATER REGIME (NONTIDAL) Seasonally Flooded to Saturated.

OTHER STUDIES

The grand fir/lady fern plant association has been described for Montana by Hansen and others (1995). Samples of the ABGR/ATFI plant association were included in the ABGR/GYDR plant association of Johnson and Clausnitzer (1992).

Grand Fir/Oak Fern Plant Association

Abies grandis/Gymnocarpium dryopteris CWF611
ABGR/GYDR n=8

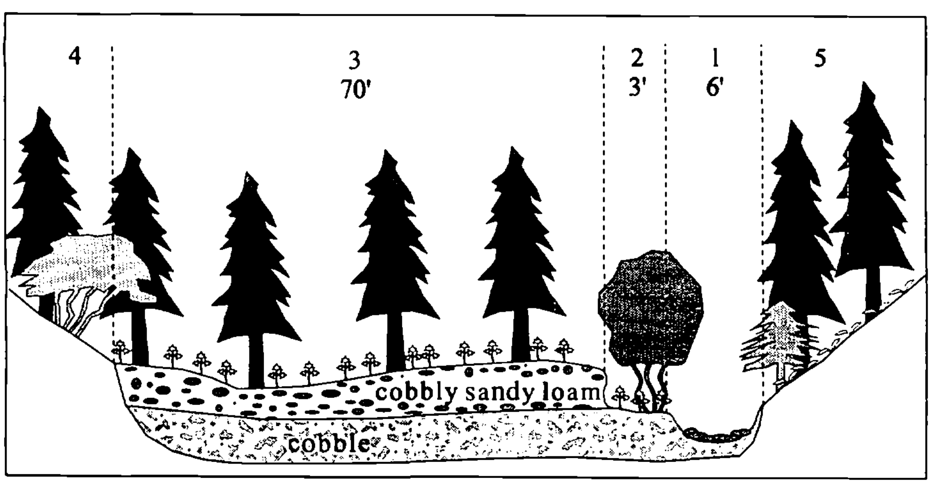
PHYSICAL ENVIRONMENT

The grand fir/oak fern plant association occurs on the Walla Walla and Pomeroy RDs (Umatilla NF). The ABGR/GYDR type is found on low and mid-elevation floodplains, terraces, and seeps from 3200 to 4500 feet. Sampled sites are in very narrow to moderate width valleys 15 to 200 feet wide. Gradients of these generally V-shaped valleys vary from 2% to 10%. Soils are predominantly volcanic ash or sandy alluvium over gravel and cobbles. Streamside sites flood seasonally but the water table drops to 2 feet below the surface in early June. Plots were installed adjacent to A2, A3, B3, B4, and F4 stream reach types. Stream widths varied from 5 to 50 feet.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	3783	278
Plot Aspect (°)	44	61
Plot Slope (%)	7	4
Valley Width (m)	31	24
Valley Gradient (%)	5	3
Valley Aspect (°)	58	59
Soil Surface Cover (%)		
Rock	1	1
Moss	48	19
Liverwort	3	7
Lichen	2	2
Litter	47	19

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, rhyolite, ash
Water Table Depth (cm)	31-100
Total Rooting Depth (cm)	10-25
Depth to Redoximporphic Features (cm)	0-7
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



1 A3 stream reach
2 **Mountain alder/oak fern,** floodplain
3 **Grand fir/oakfern,** terrace
4 Rocky Mtn. maple, south-facing sideslope
5 Grand fir/Pacific yew/queen's cup beadlily, north-facing toeslope

Figure 13. *Coombs Creek, Pomeroy RD, Umatilla NF; very high gradient, mod. low elevation, V-shaped valley; Mesic Forest Zone 2.*

VEGETATION COMPOSITION

Principal Species		Con	Cov
Dominant Overstory Trees			
ABGR	Grand fir	75	27
PIEN	Engelmann spruce	50	31
Subdominant Overstory Trees			
ABGR	Grand fir	100	14
Understory Trees			
ABGR	Grand fir	75	4
PIEN	Engelmann spruce	75	1
Tall Shrubs			
RILA	Prickly currant	100	3
SYAL	Common snowberry	88	18
ROGY	Bald-hip rose	88	2
TABR	Pacific yew	63	26
ACGL	Rocky Mountain maple	63	8
AMAL	Western serviceberry	63	1
ALIN	Mountain alder	50	4
RUPA	Western thimbleberry	50	8
Low Shrubs			
LIBO2	American twinflower	75	7
Perennial Forbs			
TITRU	Cool-wort foam-flower	88	9
SMST	Starry false-Solomon's seal	88	6
STAM	Clasp-leaf twistedstalk	88	2
PYSE	Sidebells pyrola	88	1
TRCA3	False bugbane	75	17
CLUN	Queen's cup beadlily	75	5
GATR	Sweet-scented bedstraw	75	4
ADBI	Trailplant	75	1
ACRU	Baneberry	75	1
ANPI	Piper's anemone	63	2
VIGL	Stream violet	63	2
FRVE	Woods strawberry	63	1
VIOR2	Round-leaved violet	63	1
MIPE	Alpine mitrewort	50	2
CIAL	Enchanter's nightshade	50	1
MIST2	Side-flowered mitrewort	50	1
ARCO	Heartleaf arnica	50	1
Ferns and Horsetails			
GYDR	Oak fern	100	30
ATFI	Lady fern	100	2

Grand fir dominates a multi-layered tree overstory with Engelmann spruce, a late-seral overstory species, commonly associated in these moist habitats. The shrub layer is composed of a variety of moist-site shrubs with irregular occurrences. Prickly currant and bald-hip rose are the most constant species. Common snowberry and Pacific yew are often abundant. Western serviceberry, western thimbleberry and Rocky Mountain maple are occasionally well represented. The understory is characterized by oak fern with a mean canopy coverage of 30%. A rich assemblage of associates includes cool-wort foam-flower, starry false-Solomon's seal, false bugbane, queen's cup beadlily, sweet-scented bedstraw, clasp-leaf twistedstalk, stream violet, alpine mitrewort, Piper's anemone, side-flowered mitrewort, Hooker's fairy-bells, twinflower, and lady fern. Upland vegetation types adjacent to sites sampled are: sideslopes - grand fir/oakfern, grand fir/big huckleberry, grand fir/Pacific yew/twinflower or queen's cup beadlily and grand fir/Rocky Mountain maple.

MANAGEMENT CONSIDERATIONS

Sites supporting the ABGR/GYDR plant association provide habitat for birds and mammals including woodpeckers, songbirds, bear, deer, and elk. These streamside stands contribute to the maintenance of fish habitat through streambank stabilization, shading, and woody debris recruitment to adjacent streams. Proximity to watercourses limits silvicultural options. Where this association occurs on upland seeps, unstable conditions are a concern for timber management and road building. Consideration of silvicultural system, season of operation, and transportation alternatives should provide for resource protection in stands supporting this type (Johnson and Clausnitzer 1992).

Stand Characteristics

Species	*BA*	*Range*	*Site Index*	*Range*
ABGR	46	10-160	63	49-76
PIEN	68	10-120	72	55-83
POTR2	20	—	—	—

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Needle-leaved Evergreen, WATER REGIME (NONTIDAL) Temporarily Flooded to Intermittently Flooded.

OTHER STUDIES

The ABGR/GYDR plant association was described for the Blue Mountains by Johnson and Clausnitzer (1992). This classification refines the concept with additional plot information.

Grand Fir/Rocky Mountain Maple-Floodplain Plant Association

Abies grandis/Acer glabrum - Floodplain CWS543
ABGR/ACGL-FLOODPLAIN n=10

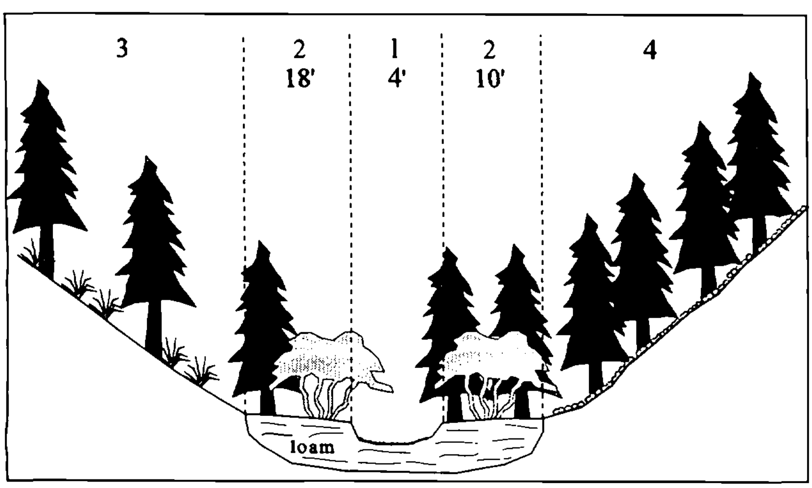
PHYSICAL ENVIRONMENT

The grand fir/Rocky Mountain maple-floodplain plant association occurs on low to mid-elevation streambanks, floodplains, and terraces in the northern and central portions of the study area (Pomeroy and Walla Walla RDs, Umatilla NF; La Grande RD and Hell's Canyon NRA, Wallowa-Whitman NF; Long Creek RD, Malheur NF). Elevations range from 2500 to 4500 feet. Low to moderate gradient, V-shaped valleys 15 to 200 feet wide are characteristic landforms but sites have been identified in steeper gradient valleys over 1000 feet wide. Soils are composed of silt loam, sandy loam, and clay loam over gravels and cobbles. Depth to this coarse alluvium varies from 4 to 16 inches. Stream types identified were A2a, A4, B2, B3, B4 and C3 types. Most of the stream reaches were B4. Stream widths range from 1-50 feet.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	3794	603
Plot Aspect (°)	53	60
Plot Slope (%)	5	8
Valley Width (m)	77	120
Valley Gradient (%)	4	3
Valley Aspect (°)	57	54
Soil Surface Cover (%)		
Submerged	1	2
Bare Ground	3	3
Gravel	1	2
Rock	2	3
Moss	25	18
Lichen	1	1
Litter	58	22

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, ash
Total Rooting Depth (cm)	15-28
Surface Layers	
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; medium: none to few	fine: none to many; coarse: few
Redoximorphic Features	none
Surface Layers	
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; medium: none to many	fine: few to many; coarse: none to few
Redoximorphic Features	none
Substrate	cobble, boulders



1 B4 stream reach
2 **Grand fir/Rocky Mtn. maple-floodplain,** floodplain
3 Grand fir/pinegrass, southeast-facing sideslope
4 Grand fir/twinflower, northwest-facing sideslope

Figure 14. *Sunshine Creek, Long Creek RD, Malheur NF; mod. high gradient, mod. elevation, V-shaped valley; Mesic Forest Zone 1.*

VEGETATION COMPOSITION

Principal Species		Con	Cov
Dominant Overstory Trees			
ABGR	Grand fir	78	29
PIEN	Engelmann spruce	22	24
PSME	Douglas-fir	22	7
Subdominant Overstory Trees			
ABGR	Grand fir	33	11
Understory Trees			
ABGR	Grand fir	78	5
PIEN	Engelmann spruce	33	2
Tall Shrubs			
ACGL	Rocky Mountain maple	100	35
SYAL	Common snowberry	78	29
ROGY	Bald-hip rose	67	12
AMAL	Western serviceberry	67	2
PHLE2	Lewis' mock-orange	44	16
RUPA	Western thimbleberry	44	13
SPBE	Birch-leaf spirea	44	4
HODI	Oceanspray	44	3
Perennial Forbs			
GATR	Sweet-scented bedstraw	100	4
OSCH	Mountain sweet-cicely	78	7
FRVE	Woods strawberry	67	1
SMST	Starry false-Solomon's seal	67	1
ADBI	Trail plant	56	1
VIGL	Stream violet	44	14
ARCO	Heartleaf arnica	44	10
ACRU	Baneberry	44	2
Perennial Grasses			
FEOC	Western fescue	56	1
BRVU	Columbia brome	44	3
Sedges and Rushes			
CAGE	Elk sedge	44	4
Ferns and Horsetails			
CYFR	Brittle bladderfern	56	tr

Grand fir dominates the overstory in climax stands of the ABGR/ACGL-Floodplain 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 late-seral/minor climax shrub on some sites. Common snowberry, bald-hip rose, Lewis' mockorange, and western thimbleberry are occasionally abundant. Western serviceberry, birch-leaf spirea, 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. Upland vegetation types adjacent to sites sampled are: sideslopes - grand fir/Rocky Mountain maple, grand fir/twinflower, grand fir/pinegrass, Douglas-fir/mallow ninebark and Douglas-fir/oceanspray.

MANAGEMENT CONSIDERATIONS

Rocky Mountain maple is an important browse species for wild ungulates and provides food and cover for birds, squirrels, and chipmunks (Uchytil 1989b). Associated shrubs provide similar habitat for wildlife. These shrubs hinder rapid tree establishment in post-harvest communities. Silvicultural systems should consider appropriate treatments to affect plantation establishment. Streamside stands provide shade, woody debris and streambank stability for associated fish habitat.

Stand Characteristics

Species	*BA*	*Range*	*Site Index*	*Range*
ABGR	45	10-80	60	44-82
PIEN	80	—	56	49-63
PSME	20	—	—	—
PIPO	40	—	—	—

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Needle-leaved Evergreen, WATER REGIME (NONTIDAL) Temporarily Flooded to Intermittently Flooded.

OTHER STUDIES

The ABGR/ACGL-Floodplain is defined as the riparian element of the ABGR/ACGL plant association (Steele and others 1981, Johnson and Simon 1987, Johnson and Clausnitzer 1992).

Miscellaneous Grand Fir Types

Grand Fir/Common Snowberry-Floodplain Plant Community Type

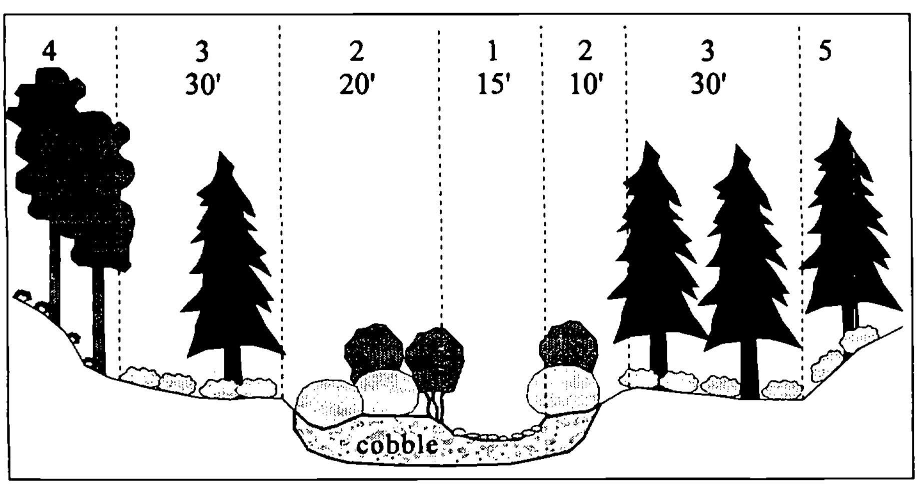
Abies grandis/Symphoricarpos albus - Floodplain CWS314
ABGR/SYAL-FLOODPLAIN n=4

The grand fir/common snowberry-floodplain community type was sampled on the Wallowa-Whitman and Malheur NFs (Baker, Pine, La Grande and Long Creek RDs). Four plots represent floodplain and terrace sites in moderate width, V-shaped valleys. Overstory vegetation is characterized by shade-tolerant grand fir (ABGR); common seral species include Engelmann spruce (PIEN), Douglas-fir (PSME), ponderosa pine (PIPO), lodgepole pine (PICO), and black cottonwood (POTR2). Common snowberry (SYAL) dominates the shrub layer with prickly currant (RILA), mountain alder (ALIN), western thimbleberry (RUPA), western serviceberry (AMAL), Lewis' mockorange (PHLE2), red-osier dogwood (COST), and black hawthorn (COST) occasionally associated. Herbaceous species commonly encountered include sweet-scented bedstraw (GATR), yarrow (ACMI), blue wildrye (ELGL), and western fescue (FEOC). Adjacent upland vegetation types are: grand fir/elk sedge, lodgepole pine(grand fir)/big huckleberry/pinegrass and grand fir/pinegrass. Further studies may expand the known distribution and importance of this type.

Grand Fir/Woolly Sedge Plant Community

Abies grandis/Carex lanuginosa
ABGR/CALA3 n=1

This community was sampled on the edge of Frog Heaven Meadows (La Grande RD, Wallowa-Whitman NF) 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. Grand fir (ABGR) dominates the stand, but lodgepole pine (PICO), western larch (LAOC), and Douglas-fir (PSME) are also present. Woolly sedge (CALA3) is abundant in the understory with 75% canopy coverage. This community may represent further development of the PICO/CALA3 community described in the lodgepole pine miscellaneous types.



1 B3 stream reach
2 **Mountain alder-red-osier dogwood**, floodplain
3 **Grand fir/common snowberry-floodplain**, terrace
4 Ponderosa pine/Idaho fescue-bluebunch wheatgrass, southwest-facing sideslope
5 Grand fir/common snowberry, northeast-facing sideslope

Figure 15. *Elk Creek, Baker RD, Wallowa-Whitman NF; high gradient, mod. elevation, trough-shaped valley; Mesic Forest Zone 1.*

Western White Pine/Tufted Hairgrass Plant Community

Pinus monticola/Deschampsia cespitosa
PIMO/DECE n=1

One plot established on a narrow floodplain along Indian Creek on Prairie City Ranger District (Malheur NF) sampled a stand of western white pine (PIMO) and lodgepole pine (PICO). Grand fir (ABGR) is present in the understory layers. Yarrow (ACMI) and tufted hairgrass (DECE) are well represented in the herbaceous layer. This floodplain community is a seral grand fir community and disturbance prevents further definition. The adjacent stream reach is a B3 type.

General Management Considerations for Douglas-Fir

Douglas fir *(Pseudotsuga menziesii var. glauca)* grows in a wide variety of climatic conditions. The mean annual temperature range is 23° to 65° F and the mean annual precipiation range is 14-24 in. Snowfall amounts in Douglas-fir zones range from 20 to 180 in. per year. Trees start producing cones at 12-15 yrs. of age, but they produce the greatest number of cones when they are 200-300 yrs. old. Flowering takes place from early May until late June. Seed dispersal occurs from mid-August to mid-September. Approximately every 7 yrs. one heavy and one medium crop of seeds is produced. Seeds are dispersed by wind and gravity; most fall within 330 ft. of the tree. Seed germination occurs on mineral or organic seedbeds (the latter are generally less than 2" thick to mineral substrate) from April to mid-May. The first year of growth is slow if limited by moisture, and drought in mid-summer triggers dormancy. First year seedlings grow best under light shade, but older seedlings require full sunlight. Douglas-fir can be a deep-rooted plant, but the root morphology that develops on individual trees varies according to soil properties. Initally a tap root develops that grows quickly during the first few years. Anchor roots grow from the taproot. Lateral root systems may develop if the water table is high. There is greater lateral spread on poorly drained or sandy-gravelly soils. At 200-300 yrs. of age the average height of trees is 100-120 ft. and the dbh is 15-40". On the best sites, dominant trees may reach 160 ft. tall and 60" dbh. Diameter and height growth are minimal after 200 yrs. and trees rarely live beyond 400 yrs.

The most destructive insects affecting Douglas-fir are the Douglas-fir tussock moth *(Orygia pseudotsugata)*, the western spruce budworm *(Choristoneura fumiferana)* Douglas-fir cone moth *(Barbara colfaxiana)*, the fir cone worm *(Dioryctria abietivorella)*, and the Douglas-fir seed chalcid *(Megastigmus spermotrophus)*. This tree species is host to hundreds of fungi, including heart rots, needle diseases. Dwarf mistletoe *(Arceuthobium douglasii)* may also parasitize branches.

Fires resistance in Douglas fir is greater than in Engelmann spruce or true firs but less than in ponderosa pine and western larch. Mature trees can survive moderately severe surface fires because of the thick corky bark on the base of the bole. It takes about 40 yrs. for a tree to develop fire-resistant bark. Characteristics that make Douglas-fir susceptible to fire are its low-growing branches and flammable foliage, which can cause crowning. Burned areas create a good seedbed for Douglas-fir to reestablish within a few hundred yards of seed trees. Trees that are damaged and weakened by fires are susceptible to insect attack. Low to moderate intensity surface fires may occur at 30 yr. return intervals on drier Douglas-fir associations (such as Douglas-fir/common snowberry).

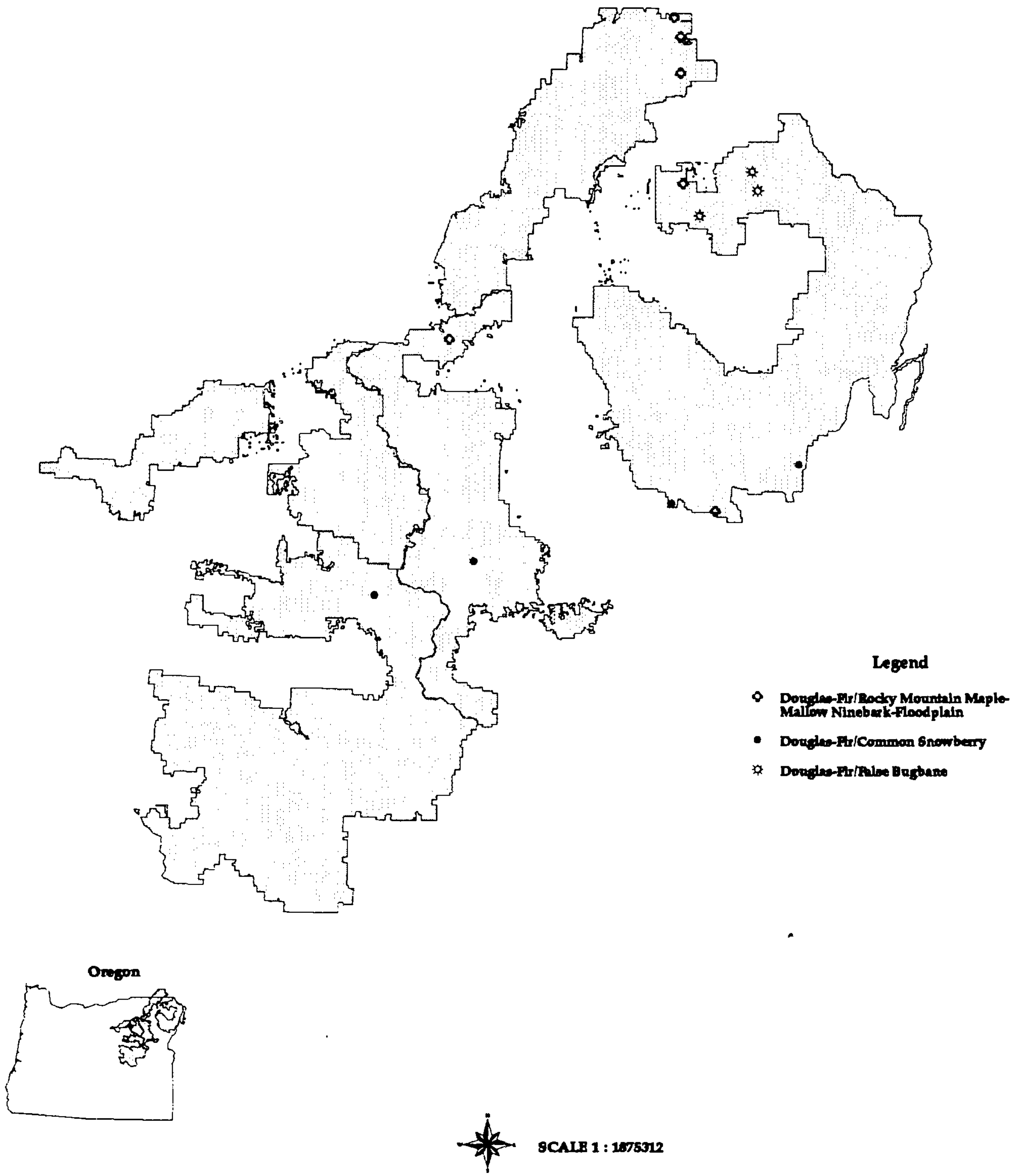
Douglas-fir stands at low elevations in south-facing drainages provide winter range for deer and elk. Seedling browsing is light and usually occurs in winter and early spring. Douglas-fir seeds are a staple food for red squirrels and an important food source for other small mammals and birds, including: Clark's nutcracker, black-capped chickadees, mountain chickadees, red-breasted nuthatches, red-winged crossbills and dark-eyed juncos. Juncos will eat seedlings, also. The needles are an important winter food of blue grouse. Palatability to livestock is low. Stands are good thermal and hiding cover for small mammals, nongame birds and upland game birds, and foliage is good nesting habitat. Snags are used by cavity-nesting birds.

(Information taken from Hermann and Lavender 1990 and Uchytil 1991c.)

Figure 16. Facing page
Sample sites for Douglas-fir types. This map does not represent the actual distribution of Douglas-fir types.

Douglas Fir Plant Associations,

Community Types & Communities



Douglas-fir/Rocky Mountain Maple-Mallow Ninebark-Floodplain Plant Association

Pseudotsuga menziesii/Acer glabrum-Physocarpus malvaceous-Floodplain CDS724
PSME/ACGL-PHMA-FLOODPLAIN n=6

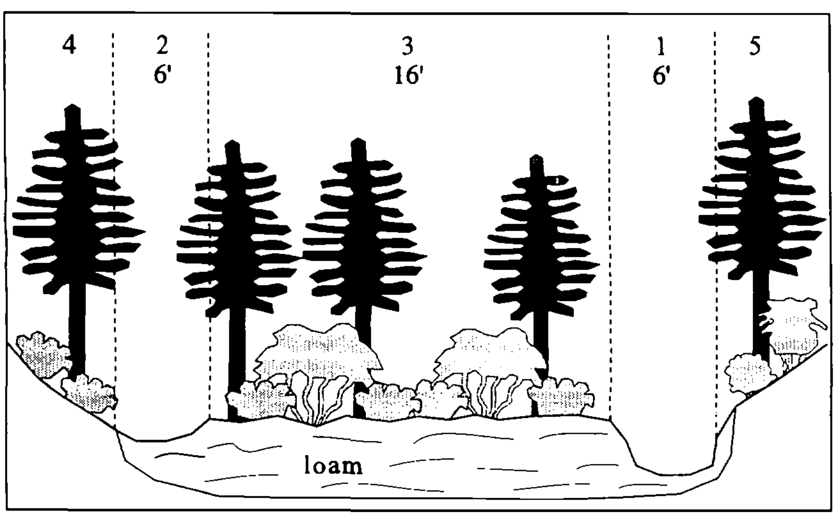
PHYSICAL ENVIRONMENT

This Douglas-fir plant association was sampled in the northern portions of the Umatilla (Pomeroy RD) and Wallowa-Whitman National Forests (Wallowa Valley, Pine and La Grande RDs). It is found on streambanks, floodplains, and terraces at elevations ranging from 2800 to 4000 feet. Valleys are generally moderate, high, and very high gradient (5 to 10% slope) V-shaped valleys. Valley widths varied from 15 feet to 660 feet with very steep side slopes. Soils are composed of 2-3 feet of silt and sandy loam over gravel, cobbles, and stones. The water table generally resides in the coarse alluvium at depths of 2-3 feet. Rosgen stream types identified were A2a, A3, A5, C3 and C4 streams. Stream widths are narrow, ranging from 5 to 15 feet.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	3363	458
Plot Aspect (°)	123	62
Plot Slope (%)	7	3
Valley Width (m)	53	76
Valley Gradient (%)	5	3
Valley Aspect (°)	116	59
Water Table Depth (cm)	125	35
Soil Surface Cover (%)		
Bare Ground	1	2
Rock	2	3
Moss	26	28
Lichen	2	3
Litter	70	33

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, unknown marine
Total Rooting Depth (cm)	10-33
Water Table Depth (cm)	100-150
Surface Layer	
Thickness (cm)	5-17
Texture(s)	organic-rich silt, silt loam, loam
Coarse Fragments (%)	0-40, gravel
Roots	very fine: many; fine: common to many; medium: none to common; coarse: —
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	0-48+
Texture(s)	silt loam, loam, fine sandy loam, sandy loam, gravelly loam
Coarse Fragments (%)	0-35, gravel
Roots	very fine: few to many; fine: few to common; medium: none to few; coarse: few to common
Redoximorphic Features	none
Substrate	
Texture(s)	gravel, cobble, clay-rich silt loam



1 A5 stream reach
2 overflow channel
3 **Douglas-fir/Rocky Mtn. maple-mallow ninebark-floodplain**, terrace
4 Douglas-fir/mallow ninebark, southwest-facing sideslope
5 Douglas-fir/oceanspray (grand fir/big huckleberry potential), northeast facing-sideslope

Figure 17. *Dry Fork Lick Creek, Pomeroy RD, Umatilla NF; high gradient, mod. low elevation, V-shaped valley; Mesic Forest Zone 2.*

VEGETATION COMPOSITION

Principal Species		Con	Cov
Dominant Overstory Trees			
PSME	Douglas-fir	83	35
PIPO	Ponderosa pine	50	6
LAOC	Western larch	33	18
POTR2	Black cottonwood	17	10
Subdominant Overstory Trees			
PSME	Douglas-fir	50	8
Understory Trees			
PSME	Douglas-fir	100	2
ABGR	Grand fir	67	1
Tall Shrubs			
SYAL	Common snowberry	100	44
ACGL	Rocky Mountain maple	100	17
PHMA	Mallow ninebark	83	7
SPBE	Birch-leaf spirea	67	12
PHLE2	Lewis' mock-orange	67	8
ROGY	Bald-hip rose	67	3
HODI	Oceanspray	50	22
AMAL	Western serviceberry	50	10
RUPA	Western thimbleberry	50	6
RILA	Prickly currant	50	2
Low Shrubs			
BERE	Creeping Oregon-grape	50	3
Perennial Forbs			
GATR	Sweet-scented bedstraw	100	5
SMST	Starry false-Solomon's seal	83	3
FRVE	Woods strawberry	83	1
ARCO	Heartleaf arnica	67	30
OSCH	Mountain sweet-cicely	67	3
SMRA	Feathery Solomonplume	67	1
VIGL	Stream violet	50	3
THOC	Western meadowrue	50	2
Perennial Grasses			
CARU	Pinegrass	50	4
FEOC	Western fescue	50	3
Sedges and Rushes			
CAGE	Elk sedge	83	5

Stands representing the PSME/ACGL-PHMA-Floodplain association 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. A mid-shrub layer composed of snowberry, birch-leaf spirea, bald-hip rose, prickly currant, or western thimbleberry is conspicuous. In the herbaceous layer, starry false-Solomon's seal, woods strawberry, mountain sweet-cicely, feathery Solomonplume, stream violet, and western meadowrue are common. Sweet-scented bedstraw and heartleaf arnica are regular and occasionally abundant understory members. Frequently occurring grasses and sedges include pinegrass, western fescue, and elk sedge. Water birch was an abundant tall shrub on a few sites, but this early successional species will be eliminated eventually by the Douglas-fir overstory canopy. Red-osier dogwood, an obligate riparian species in the study area, was common in a few sampled stands. Upland vegetation types adjacent to sites sampled are: sideslopes - grand fir/Rocky Mountain maple, Douglas-fir/mallow ninebark, Douglas-fir oceanspray and Douglas-fir/common snowberry.

MANAGEMENT

These streamside sites provide important habitat for a variety of wildlife species. Shrubs and fruit are eaten by deer, elk, bear, songbirds, and grouse. Trees provide habitat for squirrels, woodpeckers, and hawks. The densely vegetated, cool bottoms are used as bedding areas, hiding cover and thermal cover by wild ungulates (Johnson and Simon 1987). Plant community members are fire-resistant and will resprout following fire events. Bark beetles and insect defoliators may impact overstory trees stressed by recurrent drought.

Stand Characteristics

Species	*BA*	*Range*	*Site Index*	*Range*
PSME	74	40-120	72	66-75
PIPO	10	—	—	—
LAOC	35	10-60	—	—

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Needle-leaved Evergreen, WATER REGIME (NONTIDAL) Temporarily Flooded to Intermittently Flooded.

OTHER STUDIES

The PSME/ACGL-PHMA-Floodplain plant association has not been previously described. A similar type, the PSME/ACGL-PHMA plant association, was described for steep slope sites by Johnson and Simon (1987).

Douglas-fir/Common Snowberry-Floodplain Plant Association

Pseudotsuga menziesii/Symphoricarpos albus CDS628
PSME/SYAL-FLOODPLAIN n=4

PHYSICAL ENVIRONMENT

The Douglas-fir/Common Snowberry-Floodplain plant association was found in the central portion of the study area at elevations from 3300 to 4500 feet (Pine and Baker RDs, Wallowa-Whitman NF; Long Creek RD, Malheur NF). Floodplain and terrace sites are located in very narrow to very broad V-shaped valleys from 15 to 1000 feet wide. Low (1%) to very high (10%) gradient valleys were sampled. Soils generally consist of fine textured silt loam and loam over sandy loam, coarse sand, gravel, and cobbles. Distances from the surface to coarse alluvium range from 8 to 31 inches. Adjacent streams are 1 to 30 feet wide and classified as B3, C2, C3, or F4 stream types.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	3740	534
Plot Aspect (°)	192	62
Plot Slope (%)	5	3
Valley Width (m)	110	162
Valley Gradient (%)	4	4
Valley Aspect (°)	200	70
Water Table Depth (cm)	30	—
Soil Surface Depth (%)		
Submerged	3	5
Bare Ground	2	2
Moss	20	30
Litter	58	42

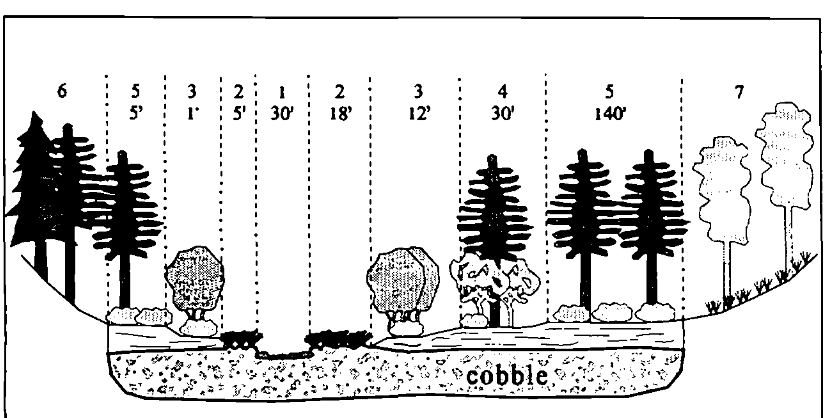
Soil Profile Characteristics

Bedrock/Parent Material(s) basalt, granite, unknown sedimentary
Total Rooting Depth (cm) 45
Water Table Depth (cm) 30

Surface Layers
- Thickness (cm) 5-41
- Texture(s) silt loam, loam
- Coarse Fragments (%) 0-10, gravel
- Roots very fine: none to many fine: common to many medium: few coarse: few
- Redoximorphic Features none

Subsurface Layer(s)
- Thickness (cm) 0-48
- Texture(s) silt loam, silty ash, loam, sandy loam, coarse sand
- Coarse Fragments (%) 0-40, gravel
- Roots very fine: none to many fine: none to few medium: none to few coarse: none to few
- Redoximorphic Features none

Substrate gravel, cobble



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

Figure 18. *Middle Fork John Day River, Long Creek RD, Malheur NF; very low gradient, mod. low elevation, flat-shaped valley; Mesic Forest Zone 1.*

VEGETATION COMPOSITION

Principal Species		Con	Cov
Dominant Overstory Trees			
PSME	Douglas-fir	75	27
PIPO	Ponderosa pine	50	35
LAOC	Western larch	25	20
POTR	Quaking aspen	25	2
Subdominant Overstory Trees			
PSME	Douglas-fir	50	4
PIPO	Ponderosa pine	25	10
Understory Trees			
POTR2	Black cottonwood	25	3
ABGR	Grand fir	25	2
PSME	Douglas-fir	25	tr
POTR	Quaking aspen	25	tr
Tall Shrubs			
SYAL	Common snowberry	100	53
ROGY	Bald-hip rose	75	4
COST	Red-osier dogwood	75	4
CRDO	Black hawthorn	50	25
RUPA	Western thimbleberry	50	tr
Perennial Forbs			
OSCH	Mountain sweet-cicely	75	4
FRVI	Broad-petal strawberry	50	10
ACMI	Yarrow	50	10
GABO	Northern bedstraw	50	6
GATR	Sweet-scented bedstraw	50	1
Perennial Grasses			
ELGL	Blue wildrye	100	10
BROR	Orcutt brome	50	26
POPR	Kentucky bluegrass	50	19
FEOC	Western fescue	50	5
Sedges and Rushes			
CAGE	Elk sedge	50	23
CADE	Dewey's sedge	50	2

This floodplain association is dominated by Douglas-fir in the overstory. Seral tree species such as ponderosa pine or western larch are important overstory components in successional stands. Common snowberry is the most abundant shrub species under late-seral or climax conditions. Two species are abundant in seral tall shrub layers: water birch and black hawthorn. These shrubs will diminish in importance as stands move successionally toward potential natural vegetation. Red-osier dogwood, bald-hip rose, and western thimbleberry are important shrub components of this plant association. The forb layer generally consists of mountain sweet-cicely, broad-petal strawberry, yarrow, northern bedstraw, and sweet-scented bedstraw. Important grasses and sedges include blue wildrye, orcutt brome, Kentucky bluegrass, western fescue, elk sedge, and Dewey's sedge. Upland vegetation types adjacent to sites sampled are: terraces - grand fir/pinegrass; sideslopes - grand fir/pinegrass, grand fir/big huckleberry, Douglas-fir/elk sedge, Douglas-fir/common snowberry and ponderosa pine/elk sedge.

MANAGEMENT

The PSME/SYAL-Floodplain plant association provides habitat for an assortment of wildlife species. Passerines, grouse, woodpeckers, deer, elk, squirrels, chipmunks, and cattle all utilize this habitat seasonally (Johnson and Clausnitzer 1992). In addition, this streamside association provides shade, streambank stability, and woody debris for fish habitat in adjacent streams. 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. Plant community components are fire-resistant and will resprout following fire. Insects and disease may impact overstory trees stressed by recurrent drought.

Stand Characteristics

Site	*Species*	*BA*	*Site Index*	*Range*
PSME	60	—	49	41-57
PIPO	23	20-30	71	—
LAOC	40	—	47	—
POTR	10	—	—	—

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Needle-leaved Evergreen, WATER REGIME (NONTIDAL) Temporarily Flooded to Intermittently Flooded.

OTHER STUDIES

The PSME/SYAL-Floodplain plant association has not been previously described.

Miscellaneous Douglas-Fir Types

Douglas-fir/False Bugbane Plant Community Type

Pseudotsuga menziesii/Trautvetteria caroliniensis
PSME/TRCA3 n=2

The Douglas-fir/false bugbane community type was sampled on the Wallowa Valley Ranger District (Wallowa-Whitman NF). Two plots represent floodplain and terrace sites in low gradient, narrow valleys. Adjacent stream reaches are B4 and C3. The adjacent slopes are PSME/PHMA or PSME/ACGL-PHMA (Johnson and Simon 1987). The PSME/TRCA3 type is characterized by the abundance and dominance of the mesic-site forb, false bugbane (TRCA3), in the understory. Scattered Douglas-fir (PSME) comprise the overstory. The tall shrub layer is diverse with mallow ninebark (PHMA), Rocky Mountain maple (ACGL), common snowberry (SYAL), bald-hip rose (ROGY), and birch-leaf spirea (SPBE) as important components. A rich assortment of mesic-site forbs is associated with false bugbane. These include: western meadowrue (THOC), starry false-Solomon's seal (SMST), stream violet (VIGL), and alpine mitrewort (MIPE).

Douglas fir/False bugbane Community Type

General Management Considerations For Pondersosa Pine

Ponderosa pine *(Pinus ponderosa)* plant associations described (PIPO/SYAL and PIPO/POPR) occupy warmer and drier sites than any of the other forested plant associations. This species grows in climates with average annual precipitation of 14-30 in. and average annual temperatures of 41-50°F. Flowering occurs in May followed by pollen shed in late May and June. Cones ripen the following year in August and seeds are ripe in August and September. Heavy seed crops occur every 8 yrs. on the average. Insects eat about 30-60% of the seeds, and seeds are also eaten by birds and small mammals. Mineral soil seedbeds result in greater germination. Seedlings can be injured or killed by rabbits, hares and pocket gophers. Squirrels and porcupines feed on saplings. Sheep and cattle can damage seedlings by trampling and bedding. Root development is greatest in medium-textured soils and least in fine-textured soils.

Many insects damage ponderosa pine including the western pine beetle *(Dendroctonus brevicomis)* and the mountain pine beetle *(Dendroctonus ponderosae)*. Trees can be parasitized by dwarf mistletoe *(Arceuthobium campylopodium)* and infected by rusts and needle cast *(Elytroderma deformans)*. Needles are killed by excessive ozone pollution.

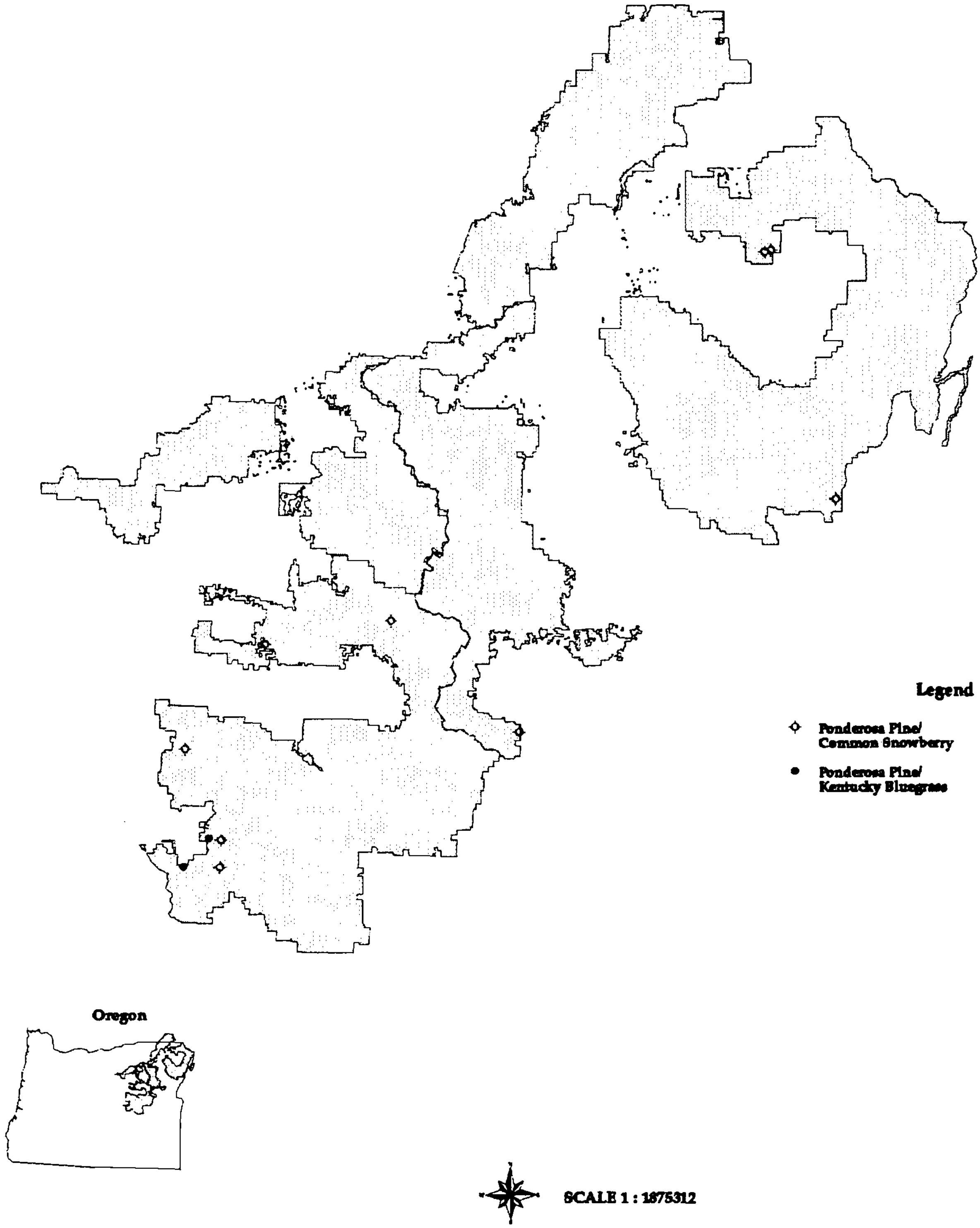
Ponderosa pine has good resistance to fire due to its: thick bark, deep roots, high foliar moisture content, insulated bud scales and medium to light fruticose lichen growth. Moderate to high severity fires can kill pole-size and smaller trees. The principal cause of mortality in ponderosa pine is crown scorch. Burned areas provide favorable seedbeds.

Needles, cones. buds, pollen. twigs. seeds and associated fungi and insects provide food for birds and mammals. Bird species that feed on seeds include juncos, evening grosbeaks, varied thrushes, Clark's nutcrackers. sparrows and chickadees. Fallen logs, snags and stumps provide shelter for cavity-dwelling birds and mammals. Ponderosa pine has low palatability for cattle, horses, sheep and elk, although deer and elk are occasional browsers. Trees provide nesting and roosting for bald eagles, wild turkeys, squirrels, hawks and owls. (Information taken from Oliver and Ryker 1990 and Habeck 1992a.)

Figure 19. Facing page
Sample sites for ponderosa pine types. This map does not represent the actual distribution of ponderosa pine types.

Ponderosa Pine Plant Associations,

Community Types & Communities



Ponderosa Pine/Common Snowberry-Floodplain Plant Association

Pinus ponderosa/Symphoricarpos albus CPS5-11
PIPO/SYAL-FLOODPLAIN n=9

PHYSICAL ENVIRONMENT

The ponderosa pine/common snowberry-floodplain association occurs on floodplains and terraces throughout the study area. It is found principally from 2800 to 5300 feet in elevation in V-shaped, trough-shaped, or flat-shaped low gradient valleys. Valley widths range from very narrow (15 feet) to very broad (>1000 feet). Soil texture varies from silt loam to sandy loam over sand, cobbles, and stones. Depth to cobbles and stones ranges from 15 to 24 inches. The water table was found 27 inches below the surface in June-July. Rosgen stream types of B3, B4, B5, C3, C4, E3, and F4 were identified and stream widths varied from 5 to 30 feet.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4175	750
Plot Aspect (°)	294	60
Plot Slope (%)	4	4
Valley Width (m)	80	118
Valley Gradient (%)	2	2
Valley Aspect (°)	293	53
Soil Surface Cover (%)		
Bare Ground	2	4
Moss	3	4
Litter	84	26

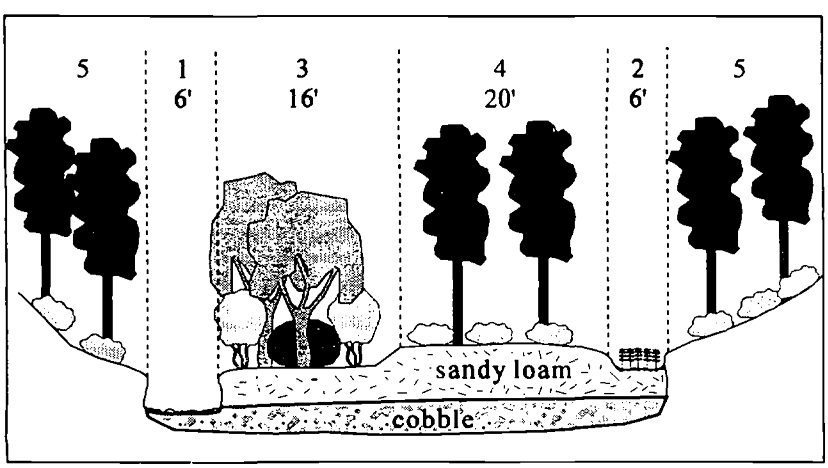
Soil Profile Characteristics

Bedrock/Parent Material(s) basalt, andesite, mixed sedimentary
Total Rooting Depth (cm) 15-28
Water Table Depth (cm) 51->79
Depth to Redoximorphic Features (cm) 33->130

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: common to many medium: common to many coarse: none to few
Redoximorphic Features none

Subsurface Layer(s)
Thickness (cm) 36-51
Texture(s) silty clay loam, clay loam, loam, sandy clay loam, sandy loam,
Coarse Fragments (%) 0-30, gravel
Roots very fine: few to common fine: few to many medium: few to many coarse: few to common
Redoximorphic Features iron concentrations

Substrate sandy clay loam, gravel, cobble



1 B3 stream reach
2 **Common horsetail**, overflow channel
3 **Black cottonwood/ mountain alder-red-osier dogwood**, floodplain
4 **Ponderosa pine/common snowberry-floodplain**, inactive floodplain
5 Ponderosa pine/common snowberry, east- and west-facing sideslope

Figure 20. *Cottonwood Creek, Long Creek RD, Malheur NF; mod. gradient, mod. elevation, V-shaped valley; Xeric Central Highlands*

VEGETATION COMPOSITION

Principal Species		Con	Cov
Dominant Overstory Trees			
PIPO	Ponderosa pine	89	36
Subdominant Overstory Trees			
PIPO	Ponderosa pine	56	18
Understory Trees			
JUOC	Western juniper	22	7
PIPO	Ponderosa pine	22	1
Tall Shrubs			
SYAL	Common snowberry	100	34
CRDO	Black hawthorn	33	75
Perennial Forbs			
ACMI	Yarrow	67	4
SMST	Starry false-Solomon's seal	56	12
FRVI	Broad-petal strawberry	56	7
GABO	Northern bedstraw	56	5
POGR	Northwest cinquefoil	44	6
Perennial Grasses			
POPR	Kentucky bluegrass	78	40
ELGL	Blue wildrye	67	5

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, grand fir, and quaking aspen are scarce and western juniper is occasionally well represented. Black hawthorn, a persistent early-seral shrub of this association, is abundant on some plots. The herbaceous layer is dominated by Kentucky bluegrass, a naturalized Eurasian grass. Yarrow, broad-petal strawberry, northern bedstraw, Northwest cinquefoil, starry false-Solomon's seal, and blue wildrye are occasionally well represented in the understory. 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/elk sedge, Douglas fir/common snowberry and western juniper/big sagebrush.

MANAGEMENT

This type is similar to the PIPO/SYAL plant association described in upland classifications, but is separated by its occurrence in stream bottoms and the occurrence of more mesic-site species (i.e., meadowrue and starry false-Solomon's seal) in the community. These floodplain communities provide important habitat for deer, elk, game birds, songbirds, and woodpeckers. The streamside association may be a valuable source of shade, woody debris, and stream stability for fish habitat. Livestock use the understory layer and can cause common snowberry to decline if a pattern of overuse is established (Kovalchik 1987). Kentucky bluegrass will eventually dominate communities that have been repeatedly overgrazed.

Stand Characteristics

Species	*BA*	*Range*	*Site Index*	*Range*
PIPO	124	50-300	79	58-99
JUOC	120	—	—	—

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Needle-leaved Evergreen, WATER REGIME (NONTIDAL) Temporarily Flooded to Intermittently Flooded.

OTHER STUDIES

The PIPO/SYAL-Floodplain plant association was described for central Oregon by Kovalchik (1987). It appears to be related to the PIPO/PRVI habitat type of Hansen and others (1995).

Miscellaneous Ponderosa Pine Types

Ponderosa Pine/Kentucky Bluegrass Plant Community Type

Pinus ponderosa/Poa pratensis CPM112
PIPO/POPR n=2

This community is represented by two sample plots on the Burns RD (Malheur NF). They occur at 4620 to 4800 ft. elevation in flat-shaped, 2% gradient, 100-300 ft. wide valleys. Adjacent stream reach types were C5 and F4. The PIPO/POPR type is dominated by ponderosa pine (PIPO) in the overstory and Kentucky bluegrass (POPR) in the understory. A diverse group of herbaceous species has common to well represented canopy coverage. These include yarrow (ACMI), strawberry (FRAGE), aster (ASTER), bedstraw(GALIU), cinquefoils (POTEN), orchardgrass (DAGL), needlegrass (STOC), and bromes (BROMU). Common snowberry (SYAL) coverage, reduced by ungulate use, has a mean of 3%. In the absence of this recurrent browsing and grazing, the sites would support the PIPO/SYAL-Floodplain plant association. Upland vegetation types adjacent to sites sampled are: ponderosa pine/elk sedge and ponderosa pine/common snowberry.

General Managment Considerations for Quaking Aspen

Quaking aspen *(Populus tremuloides)* grows throughout much of interior western North America where annual precipitation exceeds annual evapotranspiration or where soil moisture exceeds evapotranspiration. The latter situation seems to be the predominant prerequisite for aspen stand occurrence in the Blue Mountain province. The range of stand distribution is also limited to minimum and maximum growing season temperatures. This species is more tolerant of cold than of high temperatures. Trees are very intolerant of shade. Aspen grows mainly on the following soil orders: Alfisols, Inceptisols, Andisols and Mollisols. The best soils for growth are neutral or basic, well-drained, loamy, and high in organic matter, calcium, magnesium, potassium and nitrogen. The poorest soils appear to be granite-derived, which are generally acidic and sandy soils. Adequate available soil moisture and internal drainage are important. Aspen growth can be limited by water tables that are less than 2 ft. and greater than 8 ft. deep. Heavy clay soils are reported to prevent optimum growth because of limited available soil water and poor aeration. Many of the sites sampled for classification sites, however, had high water tables and/or high clay percentages in soils. Perhaps genotypic variation exists within this species that allow for growth under these wet conditions. A high percentage of stones and gravel (>30%) in soils may inhibit growth and development of trees. Generally there is more silt and clay and less sand in soils where aspen grows than on conifer sites. Quaking aspen is clonal by nature. A single stand will share one (or a small number of) root system(s). This species is primarily dioecious, i.e. trees generally produce only female or only male flowers. In one clone all trees are either female or male. 10-20% of female trees, however, and 4-5% of male trees may produce perfect flowers (flowers with both female and males parts). The ratio of female to male clones varies throughout the west. In some areas, the ratio is 1:1, but in others areas the ratio may depend on elevation or other factors and be 2:1 or 3:1 in favor of one sex or another. The disparity in sex ratios in an area may affect the amount of pollination and subsequent seed production.

Aspen flowers in May and June before the leaves expand. The principal factor governing the timing of flowering is the maximum air temperature, which must be above 54° F for at least 6 consecutive days. Female flowers are pollinated by wind. Seeds are small, have long silky hairs and can be carried many miles by wind. Large seed crops are produced by age 10 to 20 yrs. and the best crops occur when trees are 50 to 70 yrs. of age. A good seed crop is produced every 4 to 5 yrs. on average. The viability of seeds is high but lasts for only 2 to 4 weeks under good conditions. Germination occurs within one to two days of the seed landing on a favorable seedbed. A moist seedbed is a critical element for germination. Seeds can even germinate when totally submerged or in the absence of light. Exposed mineral seedbeds are best for germination; litter is poorest.

During the first year, taproots can grow 8 to 10 in. and shoot growth is 6 to 12 in. Taproots also produce laterals, which can grow 12 to 16 in. Laterals can grow up to 6 ft. during the second and third year of seedling growth. As the root system develops, two other types of roots are produced: feeders, which grow within the first two to three ft. of soil; and sinkers, which extend from the lateral roots to 10 ft. or more below the soil surface. Few seedlings survive under natural conditions, but those that do grow rapidly for the first twenty years and then slow down. Vegetative reproduction from an established clone or stand is much more common. The lateral roots of the clone, which grow about one to four in. below the soil surface produce suckers. Development of suckers is suppressed by auxins produced in the shoots or branch ends of aboveground trees and are transported into the root system. At the same time, cytokinens are produced in the roots, which initiate new shoot development. When trees are cut, burned or die from disease, insect infestation or other means, the auxin supply to the roots is eliminated. The cytokinens accumulate in the roots and stimulate sucker initiation. If trees are merely girdled, the downward transport of auxin is stopped, but the upward translocation of cytokinens is not halted. Therefore, cytokinens do not accumulate in the roots and sucker initiation is not as prolific.

The carbohydrate reserve in the root system of the clone supplies vital energy for developing suckers. They need energy until they penetrate the soil surface, produce leaves and start photosysnthesizing. This carbohydrate supply is especially crucial when all aboveground stems in a clone are eliminated. The soil temperature is the most critical environmental factor affecting the initiation of suckers. The optimal temperature for stimulating sucker development is 74° F. Excess soil moisture or drought may inhibit suckers. Heaviest sucker growth occurs after moderate intensity fires or clearcutting of all trees. Light severity fires may not produce sufficient overstory mortality for abundant sucker production; high severity fires may damage the root system and inhibit sprouting. Under the best conditions trees may reach a height of 120 ft. and 54 in. dbh. Usually, however, mature stands are 66 to 82 ft. tall and average 7 to 12 in. dbh. Individual trees have a lifespan of 90-120 yrs. The clone, however, may be thousands of years old. Some quaking aspen stands appear to be self-perpetuating: types described in this classification are quaking aspen/woolly sedge, quaking aspen/aquatic sedge, quaking aspen/bluejoint reedgrass and quaking aspen/mesic forb. Some stands, however, are seral to coniferous forest types: in this classification, those types are probably quaking aspen/common snowberry and quaking aspen/Kentucky bluegrass. Exact soil and environmental factors that cause one or the other situation to occur are unknown.

Insects that cause defoliation are: the fall webworm (*Hyphantria cunea*), tent caterpillars (*Malacosoma* spp.), the large aspen tortrix (*Choristoneura conflictana*), the aspen leaf-tier (*Sciaphila duplex*), and the satin moth (*Leucoma salicis*). Insects that can cause stem girdling, stem breakage, crown dieback and predisposition to disease are: blue alder agrillus (*Agrillus burkei*), the poplar borer (*Saperda calcarata*) and the bronze poplar borer (*Agrilus granulatus liragus*). The principal diseases affecting aspen in the Blue Mountains province are: 1. Cytospora cankers (*Cytospora* spp.), hypoxylon canker (*Hypoxylon mammatum*) and sooty bark canker (*Encoella pruinosa*), which cause stem breakage, predisposition to decay and mortality; 2. Bethel's shepherd's crook (*Ventuia tremulae*), which causes shoot dieback and defoliation; 3. white trunk rot (*Phellinus tremulae*), which causes stem breakage and mortality; 4. Melampsora rusts (esp. *Melampsora medusae*), which cause defoliation; and 5. mottled rot, which causes windthrow and mortality. Diseases are a primary factor in tree mortality and cycling of stands in a clone.

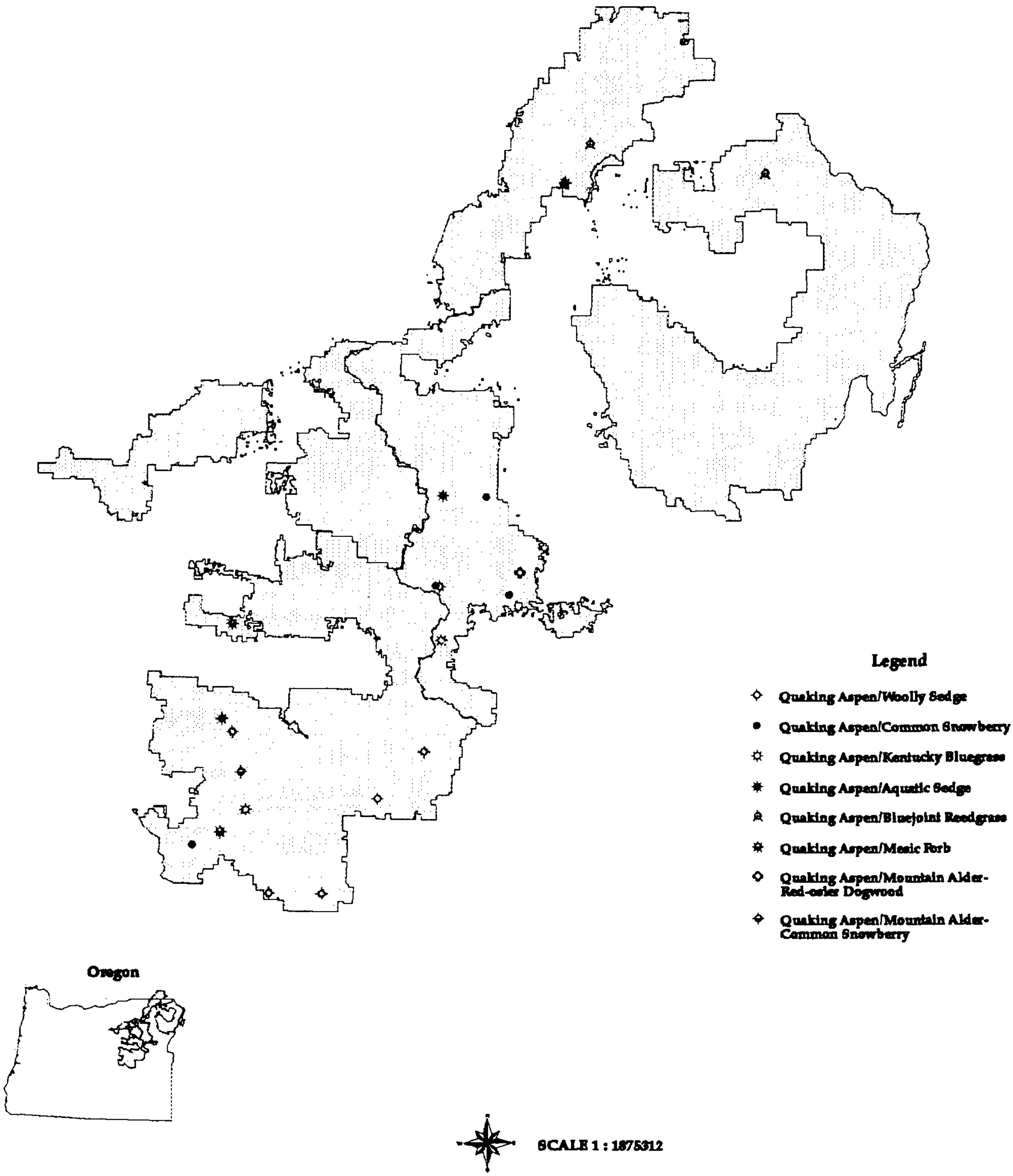
Above ground aspen stems are highly susceptible to all but the lowest severity surface fires because of their thin bark. After trees reach 6" dbh or greater they become more resistant to fire with age. Large trees have slightly thicker bark and a greater amount of cambium, which can help them to survive higher severity fires. The root system can survive low and moderate severity fires and probably most high severity fires as well. Almost all roots are protected when the soil moisture (by volume) is 25% or greater. Fire can damage cambium, buds and leaves. When living tissue is heated to about 150° F or higher, mortality occurs. The length of time that the tree is heated is the primary factor influencing damage to the cambium: experiments have shown that heating of the cambium to 120° F for one hour will kill the tissue. After heating, trees may not die for a year or more: the phloem may be damaged and the xylem still functioning. Once the bole is damaged, insects and wood rotting fungal species may enter the trees and cause secondary infections and mortality. Following fires, sucker growth is often vigorous. Sucker densities can range from 37,000 to 370,000 per acre.

Quaking aspen stands provide valuable wildlife habitat in the Blue Mountain landscape. They are important foraging, nesting, breeding and resting sites for a variety of birds and mammals. Elk may use aspen stands year round. Deer will frequent aspen stands until snows are too deep. Rabbits and hares feed on buds, twigs and bark in summer and winter. Small rodents such as squirrels, pocket gophers, mice and voles eat the bark in winter. Porcupine eat bark in winter and buds and twigs in the spring. Beavers use stems for building lodges and dams and will eat leaves, bark and twigs. Some of the bird species that frequently use aspen stands are grouse, ducks, red-breasted nuthatches, red-naped sapsuckers, mourning doves, downy woodpeckers, crossbills, woodcocks, grosbeaks and woodpeckers. Ruffed grouse use sapling stands for brooding, pole-sized stands for overwintering and breeding and older stands for nesting cover and winter food. (Information taken from Perala 1990, Tirmenstein 1988 and Schmitt 1996.)

Figure 21. Facing page
Sample sites for quaking aspen types. This map does not represent the actual distribution of quaking aspen types.

Quaking Aspen Plant Associations,

Community Types & Communities



Quaking Aspen/Woolly Sedge Plant Association

Populus tremuloides/Carex lanuginosa HQM211
POTR/CALA3 n=5

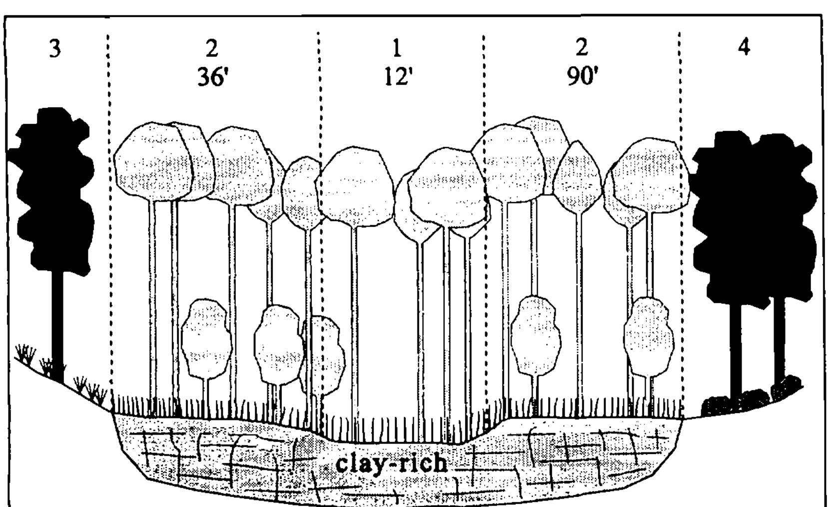
PHYSICAL ENVIRONMENT

Sampled plots were located in the southern portion of the Malheur National Forest (Burns, Prairie City and Bear Valley RDs). These sites are associated with wet or moist basins, or streamside floodplains between 4800 and 5400 feet in elevation. Adjacent vegetation is principally shrub steppe sagebrush communities. These basins function as headwaters for perennial streams in the area. Trough-shaped, low and moderate gradient valleys, 60-1000 feet wide are characteristic of this type. Soils have surface horizons of fine-textured silt loam with silty clay loam or silty clay 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 15 inches in June-July. Further, 8% of the soil surface was submerged at this time. When plots were associated with streams, stream reach types of C6 and G6 were identified.

Valley Environment	**Mean**	**S.D**
Elevation (ft.)	5178	301
Plot Aspect (°)	150	63
Plot Slope (%)	2	2
Valley Width (m)	167	130
Valley Gradient (%)	2	2
Valley Aspect (°)	123	54
Soil Surface Cover (%)		
Submerged	8	18
Bare Ground	1	2
Moss	6	9
Litter	85	21

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, tuff, mixed alluvium
Total Rooting Depth (cm)	30-51
Water Table Depth (cm)	10-64
Depth to Redoximorphic Features (cm)	10-16
Surface Layer	
Thickness (cm)	10-35
Texture(s)	silt loam, silty clay loam
Coarse Fragments (%)	0
Roots very fine: many; medium: none to few	fine: many; coarse: none to few
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	13-89
Texture(s)	silty clay, sandy loam
Coarse Fragments (%)	0
Roots very fine: many; medium: none to common	fine: common to many; coarse: none to few
Redoximorphic Features	common iron oxidation
Substrate	clay-rich silt loam to loam



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

Figure 22. *E. Fk. Rattlesnake Creek, Burns RD, Malheur NF; very low gradient, mod. high elevation, trough-shaped headwater basin; Continental Zone*

VEGETATION COMPOSITION

Principal Species		Con	Cov
Dominant Overstory Trees			
POTR	Quaking aspen	80	39
PIPO	Ponderosa pine	20	1
Subdominant Overstory Trees			
POTR	Quaking aspen	80	21
Understory Trees			
POTR	Quaking aspen	100	8
PIPO	Ponderosa pine	40	1
Tall Shrubs			
SYAL	Common snowberry	40	2
Perennial Forbs			
SMST	Starry false-Solomon's seal	80	20
FRVI	Broad-petal strawberry	80	6
THOC	Western meadowrue	60	8
MEAR3	Field mint	40	18
IRMI	Western blue flag	40	13
GATR	Sweet-scented bedstraw	40	4
TRLO	Long-stalked clover	40	2
Perennial Grasses			
POPR	Kentucky bluegrass	100	7
ELGL	Blue wildrye	60	25
PHPR	Common timothy	40	3
Sedges and Rushes			
CALA3	Woolly sedge	100	41
CAMI	Small-winged sedge	60	1
CANE	Nebraska sedge	40	2
JUBA	Baltic rush	40	2

Quaking aspen dominates both the overstory and understory tree layers in the POTR/CALA3 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 41%. 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. Upland vegetation types adjacent to sites sampled are: terraces - ponderosa pine/Kentucky bluegrass; sideslopes-ponderosa pine/elk sedge, ponderosa pine/ big sagebrush or bitterbrush/Idaho fescue-bluebunch wheatgrass and/ or ponderosa pine/low sagebrush.

MANAGEMENT

Understory aspen and woolly sedge provide browse and forage for cattle, deer, and elk. Woolly sedge appears highly palatable to ungulates and overgrazing of this type promotes Kentucky bluegrass, Baltic rush, and Nebraska sedge (Kovalchik 1987). Frequently encountered in POTR/CALA3 plots, elk "rub" trees seem to be important components of animal habitat. The aspen overstory also provides habitat for a variety of songbirds and woodpeckers. Beaver use aspen as food and building material for lodges and dams. Sites supporting this community are a source of landscape diversity, and management alternatives should include the maintenance and enhancement of this landscape element.

Stand Characteristics

Species	*BA*	*Range*	*Site Index*	*Range*
POTR	74	30-130	—	—

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Seasonally Flooded to Temporarily Flooded.

OTHER STUDIES

Kovalchik (1992) identified the POTR/CALA3 plant association as a miscellaneous type in eastern Washington.

Quaking Aspen/Common Snowberry Plant Community Type

Populus tremuloides/Symphoricarpos albus HQS221
POTR/SYAL n=5

PHYSICAL ENVIRONMENT

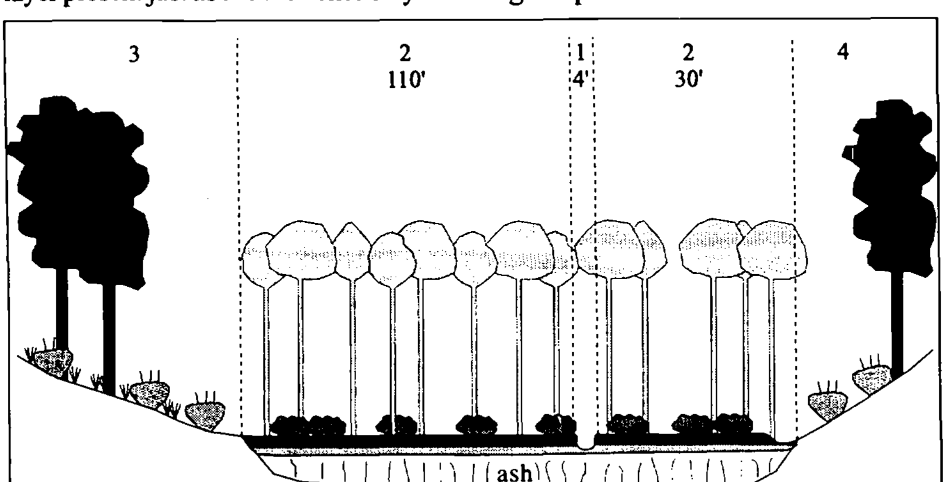
The quaking aspen/common snowberry community type is found throughout the study area. Sites were sampled on Baker and Pine RDs (Wallowa-Whitman NF) and Burns and Bear Valley RDs (Malheur NF). Plots are associated with dry or moist basins, terraces, or seeps at 4400 to 5800 feet elevation. Trough-shaped, low and moderate gradient valleys, 60-200 feet wide are characteristic of sampled areas; one plot occurred in a deep, V-shaped valley. This community type also occurs on landforms such as mountain slopes, ridges, and plateaus associated with upland vegetation where it was not sampled for this study. Soils have surface horizons of loam and silt loam and subsurface horizons typically of fairly dense silty clay loam overlying gravel and cobble substrates. A few profiles had an ash layer present just above the dense clay. Mottling was present at a depth of 31 inches in one plot situated in a wet basin. Where streams were present, they were classified as F3 and F6.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4904	508
Plot Aspect (°)	78	44
Plot Slope (%)	6	8
Valley Width (m)	54	23
Valley Gradient (%)	3	1
Valley Aspect (°)	33	28

Soil Surface Cover (%)		
Bare Ground	3	3
Litter	64	47

Soil Profile Characteristics

Bedrock/Parent Material(s)	andesite, glacial moraines, unknown marine, mixed sedimentary
Total Rooting Depth (cm)	25-51
Depth to Mottling (cm)	25-45
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)



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

Figure 23. *South Fork John Day River Headwaters, Burns RD, Malheur NF; low gradient, mod. high elevation, trough-shaped valley; Continental Zone*

VEGETATION COMPOSITION

Principal Species		Con	Cov
Dominant Overstory Trees			
POTR	Quaking aspen	100	53
PIPO	Ponderosa pine	20	30
JUOC	Western juniper	20	10
Subdominant Overstory Trees			
POTR	Quaking aspen	20	3
Understory Trees			
POTR	Quaking aspen	60	16
ABLA2	Subalpine fir	20	7
PIPO	Ponderosa pine	20	5
ABGR	Grand fir	20	2
Tall Shrubs			
SYAL	Common snowberry	100	29
RONU	Nootka rose	40	12
Perennial Forbs			
ACMI	Yarrow	100	4
THOC	Western meadowrue	60	7
VIOLA	Violet	60	4
FRVE	Woods strawberry	60	1
GATR	Sweet-scented bedstraw	60	1
IRMI	Western blue flag	40	29
ASFO	Leafy aster	40	10
GABO	Northern bedstraw	40	10
SIOR	Oregon checkermallow	40	7
TAOF	Dandelion	40	7
GEMA	Large-leaf avens	40	5
FRVI	Broad-petal strawberry	40	4
GEVI	Sticky geranium	40	3
Perennial Grasses			
POTR	Kentucky bluegrass	100	23
ELGL	Blue wildrye	80	21
PHPR	Common timothy	40	4
Sedges and Rushes			
CAGE	Elk sedge	40	17
CADE	Dewey's sedge	40	3

This community type is dominated by quaking aspen in the tree layer with conifers occasionally well represented or abundant. These conifers may indicate potential natural vegetation of sites currently dominated by POTR/SYAL. Common snowberry is characteristic in the understory with mean coverage of 29%. Nootka rose is occasionally well represented. The herbaceous layer is generally dominated by grasses and sedges with Kentucky bluegrass, blue wildrye, common timothy, pinegrass, and elk sedge as important understory members. The forbs are a diverse group including yarrow, western meadowrue, violets, western blue flag, leafy aster, northern bedstraw, Oregon checkermallow, dandelion, and large-leaf avens. Upland vegetation types adjacent to sites sampled are: terraces - ponderosa pine/common snowberry-floodplain, Douglas fir/common snowberry-floodplain; sidelopes - ponderosa pine/big sagebrush/elk sedge, ponderosa pine-Douglas-fir, grand fir/pinegrass, grand fir/elk sedge and/or subalpine fir/elk sedge.

MANAGEMENT CONSIDERATIONS

Understory aspen and shrubs are browsed by both domestic and wild ungulates. Continuous and severe ungulate use results in a decrease of the snowberry component while Kentucky bluegrass increases in abundance. Further overuse will lead to decline in the aspen overstory as it becomes poorly stocked and overmature (Kovalchik 1987). The shrub understory provides habitat for both game and nongame birds while the aspen overstory is used by woodpeckers, chickadees, flickers, and other bird species for nesting and foraging. Streamside stands are important beaver habitat and provide food and building material for lodges and dams. Sites supporting this type are a principal source of landscape diversity and aesthetic enjoyment. Development of management alternatives should include fire and silvicultural treatments to maintain aspen dominance as the conifer component increases over time.

Stand Characteristics

Species	*BA*	*Range*	*Site Index*	*Range*
POTR	73	20-140	—	—
ABGR	20	—	—	—
ABLA2	20	—	—	—

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded to Intermittently Flooded.

OTHER STUDIES

The POTR/SYAL/ELGL community type has been described for central Oregon by Kovalchik (1987). Similar vegetation has been described by Powell (1988) in Colorado, Hansen and others (1995) in Montana, John and others (1988) in central Washington, Severson and Thilenius (1976) in the Black Hills, Hoffman and Alexander (1980 and 1983) in Colorado, Mueggler and Campbell (1982) in Idaho, and Williams and others (1990) in northeastern Washington.

Quaking Aspen/Kentucky Bluegrass Plant Community Type

Populus tremuloides/Poa pratensis HQM122
POTR/POPR n=4

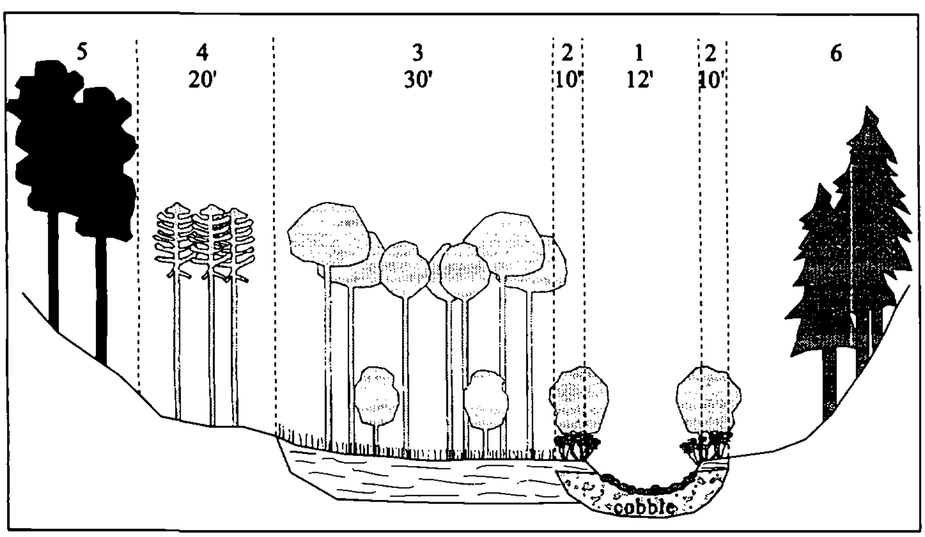
PHYSICAL ENVIRONMENT

Plots representing this type were sampled in the southern portion of the study area (Burns and Bear Valley RDs, Malheur NF; Unity RD, Wallowa-Whitman NF). These sites are associated with wet or moist basins, or terraces between 4400 and 5400 feet. Low and moderate gradient, trough-shaped or V-shaped valleys, 60-1000 feet wide are characteristic landforms encountered. Soils are similar to those described for other aspen communities — silt loam over layers with high clay content at about 20 inches deep. Charcoal is evident in a few soil profiles beneath aspen. This material may have been washed in from surrounding uplands following a fire event as well as representing remnants of material burned on site. One site was associated with a stream reach type of B3.

Valley Environment	Mean	S.D.
Elevation (ft.)	4850	376
Plot Aspect (°)	158	174
Plot Slope (%)	3	1
Valley Width (m)	125	151
Valley Gradient (%)	3	1
Valley Aspect (°)	37	36
Soil Surface Cover (%)		
Bare Ground	1	1
Rock	1	2
Moss	3	5
Litter	76	44

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, andesite, marine sedimentary
Total Rooting Depth (cm)	20-60
Water Table Depth (cm)	110
Depth to Redoximorphic Features (cm)	60
Surface Layer	
Thickness(cm)	8-46
Texture(s)	silt loam, clay loam
Coarse Fragments (%)	0
Roots	very fine: many; fine: common to many; medium: few to common; coarse: none to few
Redoximorphic Features	none
Subsurface Layer	
Thickness(cm)	28-43
Texture(s)	silt, silt loam, sandy loam
Coarse Fragments (%)	0
Roots	very fine: none to many; fine: common to many; medium: few to common; coarse: none to few
Redoximorphic Features	some iron depletions
Substrate	sandy clay, clay



1 B3 stream reach
2 **Mountain alder-currants/ mesic forb**, banks
3 **Quaking aspen/Kentucky bluegrass**, floodplain
4 Lodgepole pine, old road bed
5 Ponderosa pine, west-facing sideslope
6 Grand fir, east-facing sideslope

Figure 24. *Middle Fork Burnt River, Unity RD, Wallowa-Whitman NF; mod. gradient, mod. elevation, V-shaped valley; Mesic Forest Zone 1.*

VEGETATION COMPOSITON

Principal Species		Con	Cov
Dominant Overstory Trees			
POTR	Quaking aspen	100	43
PICO	Lodgepole pine	25	5
Subdominant Overstory Trees			
POTR	Quaking aspen	75	44
Understory Trees			
POTR	Quaking aspen	75	10
PIPO	Ponderosa pine	50	1
JUOC	Western juniper	25	4
PICO	Lodgepole pine	25	2
Tall Shrubs			
SYAL	Common snowberry	75	4
Perennial Forbs			
ACMI	Yarrow	75	2
THOC	Western meadowrue	75	2
GEMA	Large-leaf avens	75	2
FRVI	Broad-petal strawberry	75	2
SMST	Starry false-Solomon's seal	75	1
FRVE	Woods strawberry	50	14
VERAT	False-hellebore	50	14
IRMI	Western blue flag	50	4
TRLO	Long-stalked clover	50	2
Perennial Grasses			
POPR	Kentucky bluegrass	100	53

Quaking aspen dominates the overstory and understory tree layers in the POTR/POPR community type. Conifer overstory and regeneration are occasionally common and may indicate potential for these disturbed sites. Shrubs are poorly represented with common snowberry the most constant shrub present. A diverse group of forbs includes yarrow, western meadowrue, large-leaf avens, broad-petal strawberry, starry false-Solomon's seal, woods strawberry, false-hellebore, western blue flag, and long-stalked clover. Kentucky bluegrass is the most constant and abundant graminoid. Upland vegetation types adjacent to sites sampled are: terraces - lodgepole pine, ponderosa pine/ big sagebrush/Idaho fescue-bluebunch wheatgrass; sideslopes - grand fir/pinegrass, ponderosa pine/big sagebrush/Idaho fescue-bluebunch wheatgrass, ponderosa pine/elk sedge.

MANAGEMENT CONSIDERATIONS

Sites representing the POTR/POPR type have been heavily used by livestock, deer, and elk. The recurrent disturbance results in a grazing disclimax of quaking aspen communities (Hansen and others 1996). Potential vegetation of such sites could be as varied as Douglas-fir/common snowberry or quaking aspen/woolly sedge. A planned series of late spring burns may eliminate Kentucky bluegrass (Uchytil 1993) and controls conifer establishment. This treatment maintains vigorous aspen stands and enhances landscape diversity and wildlife values.

Stand Characteristics

Species	*BA*	*Range*	*Site Index*	*Range*
POTR	67	40-80	—	—
PIPO	30	—	57	48-66

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded to Intermittently Flooded.

OTHER STUDIES

The POTR/POPR community type has been described by Powell (1988) in Colorado, Hansen and others (1995) in Montana, and Mueggler and Campbell (1982) in Idaho.

Miscellaneous Quaking Aspen Types

Quaking Aspen/Aquatic Sedge Plant Community Type

Populus tremuloides/Carex aquatilis
POTR/CAAQ n=2

Two plots sampled on Baker and Walla Walla RDs (Wallowa-Whitman and Umatilla NFs) represent the POTR/CAAQ community type. It is found in moist basins at moderate elevations. Quaking aspen (POTR) and subordinant conifers (predominantly Engelmann spruce [PIEN]) comprise an overstory layer. The understory is dominated by grasses and sedges. Aquatic sedge (CAAQ) is abundant on both sites. Stands of this type have seasonally wet, fine-textured mineral soils with mottling evident in a layer 29 inches below the soil surface. Beaver, deer, elk, and a variety of birds use these sites.

Quaking Aspen/Bluejoint Reedgrass Plant Community Type

Populus tremuloides/Calamagrostis canadensis HQM123
POTR/CACA n=3

The POTR/CACA community type is represented by three plots in the northern portion of the study area (Walla Walla and Wallowa Valley RDs, Umatilla and Wallowa-Whitman NFs). It was sampled in wet basins at 5000 feet elevation. Quaking aspen (POTR) dominates a multi-storied tree layer with grasses and sedges prominent in the understory. Bluejoint reedgrass (CACA) is abundant with mean coverage of 48%. Shrubs are nearly absent. Surface water was present at one site into the month of July. Soils are composed of fine-textured silt loam and clay loam with increasing bulk density at depth. Hansen and others (1995) described this unit in Montana. Surrounding upland vegetation types are grand fir associations.

Quaking Aspen/Mountain alder-Red-osier Dogwood Plant Community

Populus tremuloides/Alnus incana-Cornus stolonifera
POTR/ALIN-COST n=1

The POTR/ALIN-COST community is represented by one plot located on a floodplain at moderate elevation in the Wallowa-Whitman National Forest (Baker RD). Quaking aspen (POTR), red-osier dogwood (COST), mountain alder (ALIN), common snowberry (SYAL), common chokecherry (PRVI), and blue wildrye (ELGL) are important components. The soil was composed of silt loam over sand, gravel and cobbles on this streamside floodplain. The adjacent stream reach type was a B3. This type appears to be a variation on the mountain alder-red osier dogwood/mesic forb association. Adjacent upland vegetation types are ponderosa pine associations.

Quaking Aspen/Mountain Alder-Common Snowberry Plant Community

Populus tremuloides/Alnus incana-Symphoricarpos albus
POTR/ALIN-SYAL n=1

One site on a floodplain at 5000 feet elevation (Bear Valley RD, Malheur NF) supported a community of quaking aspen (POTR), mountain alder (ALIN), common snowberry (SYAL), and a variety of forbs dominated by western meadowrue (THOC) and asters (ASTER). Graminoids were poorly represented. The soil was composed of silt loam over cobbles, gravel and sand at a depth of 17 inches. The adjacent stream reach type was a B3. This site provides habitat for deer, elk, and passerines. This type appears to be a variation of the mountain alder-common snowberry association. Adjacent upland vegetation types are ponderosa pine associations.

Quaking Aspen/Mesic Forb Plant Community Type

*Populus tremuloides/*Mesic forb
POTR/MESIC FORB n=2

Two plots installed in broad, moist basins (5000 to 5460 ft. elevation) of the Malheur National Forest (Burns and Long Creek RDs) supported the quaking aspen/mesic forb community type. Aspen (POTR) dominates a multi-storied stand with a diverse assortment of mesic-site forbs. Shrubs and native grasses are scarce to poorly represented. Both plots were used by domestic livestock, wild ungulates, beaver, woodpeckers, and songbirds. Soils are silt loam or sandy loam over dense clay loam.

General Management Considerations for Black Cottonwood

Black cottonwood (*Populus trichocarpa*) grows in a variety of western climates from relatively arid to humid. Annual precipitation across its range averages from 10-120 in. Maximum temperatures range from 60° to 117° F, and minimum temperatures range from 32° to -53°F. Soils on which black cottonwood grows are commonly Entisols and Inceptisols. In the Blue Mountains, black cottonwood populations are found up to approximately 3500 to 4000 ft. elevation. In the Wallowa Mountains populations are found at higher elevations, perhaps as a result of the more moderate climate. Optimum growth occurs on soils that have abundant moisture, oxygen and nutrients and where the pH is neutral (6.0 to 7.0).

Black cottonwood is a dioecious species; male and female catkins are on separate trees. Plants are sexually mature at about 7 to 10 yrs. of age, at which time they are about 30 to 55 ft. tall and 5 to 8 in. dbh. Flowering takes place from early March to mid-June, approximately 2 weeks before leaf initiation, and tends to coincide with average springtime peaks in riverine flow. Seeds ripen and are disseminated from late May to mid-July, generally at the same time that spring flows are declining and favorable seedbeds along streams will become available. Abundant crops of minute seeds with long, cottony white hairs are produced every year. The seed is light and buoyant and can be transported long distances by wind and water. Seed viability is 1 to 4 weeks. Once the seed is wet, viability will be lost in 2 to 3 days if an appropriate germination site is not encountered. Subsequent germination is rapid, but requires moist soil for one to two weeks. Special root hairs for anchoring the seedling and absorbing water and nutrients are quickly produced. If the rate of water table decline exceeds the rate of root growth (approx. $^1/_2$ in/day), seedling mortality can be very high. Full sunlight is required for seedlings to germinate. There is little endosperm in the seeds; thus, seedlings are highly dependent upon photosynthate from the cotledons and juvenile leaves. Fine silt and sand substrates allow higher rates of root growth and seedling establishment than coarse, gravelly substrates. Energy is initally allocated to the developing root system. Once the roots are well established, rapid height growth follows. Black cottonwood is tolerant of flooding throughout its lifespan, including at the seedling stage. This flood tolerance along with the rapid growth of seedlings gives black cottonwood a competitive advantage over other alluvial bar colonizers. The most common methods of asexual reproduction in this species are: the burial and subsequent rooting of branches that have broken and fallen from mature trees; and the abscission, falling, transport and rooting of branchlets (known as cladoptosis) on favorable sites, such as alluvial bars. Black cottonwood rooted or unrooted cuttings can usually be successfully planted. Mature stand density is 270 to 730 trees/acre. The average lifespan of this species is 100-200 yrs.

Black cottonwood populations along a stream or river reach are composed of even-aged stands or galleries. Upon inspection of these galleries, it is evident that they correspond to the movement of the stream channel and development of fluvial surfaces that corresponds to this movement. New stands of cottonwood are usually established on a fresh alluvial bar deposit or on a heavily scoured section of floodplain, where unvegetated mineral sediment has been exposed. The black cottonwood/ Pacific willow plant association occurs on these sites. On more mature bars or floodplains, where layers of finer-textured sediments often overlie the original coarse-textured bar deposits, the black cottonwood/mountain alder-red-osier dogwood and possibly, the black cottonwood/Rocky Mountain maple types occur. Finally, the black cottonwood/common snowberry community type occurs on terraces that are infrequently flooded and composed of deeper fine-textured alluvial deposits that display readily visible pedogenic soil horizons. This cycle of stand development will continue across the valley as the stream meanders and changes pattern over time. Managers should look for new stand development on fresh scour and deposition sites rather than on older terraces or heavily vegetated floodplains, where the water table is too deep and/or vegetative competition and shade are too high for abundant seedling establishment. Older stands are important as seed sources and for valuable animal habitat and erosion control. Maintenance of various stand ages will perpetuate populations.

Unseasonably early and late frosts can injure or kill seedlings and young saplings. Frost cracks provide an entrance for decay fungi. Ice storms, heavy snowfall and high winds can cause breakage and permanent bending of branches. In the Blue Mountains black cottonwood is highly susceptible to damage from several insects: the fall webworm (*Hyphantria cunea*), tent caterpillars (*Malacosoma* spp.), and the satin moth (*Leucoma salicis*), which primarily cause defoliation; and the bronze poplar borer (*Agrilus granulatus liragus*) and poplar borer (*Saperda calcarata*), which can cause crown dieback, stem girdling, stem breakage and predisposition to other diseases. Diseases that affect black cottonwood in this province are: 1. cytospora canker (*Cytospora* spp.) and sooty-bark canker (*Encoella pruinosa*), which cause stem breakage, predisposition to decay and mortality; 2. *Melampsora* rusts, which cause defoliation; 3. mottled rot, which can lead to windthrow and mortality; and 4. possibly, Bethel's shepherds crook (*Ventuia tremulae*), which causes shoot dieback and defoliation in seedlings and saplings.

The thin bark and relatively shallow root systems of black cottonwood seedlings and saplings make them highly susceptible to fires of any intensity. After 10 to 20 years, trees may have thick enough bark to withstand low-intensity surface fires, but fire wounds may facilitate the onset of heartwood decay. Trees can sprout from the stump following top-kill by fire. Fires can create favorable conditions for seedling establishment by thinning the overstory, but soil moisture must be adequate for germination.

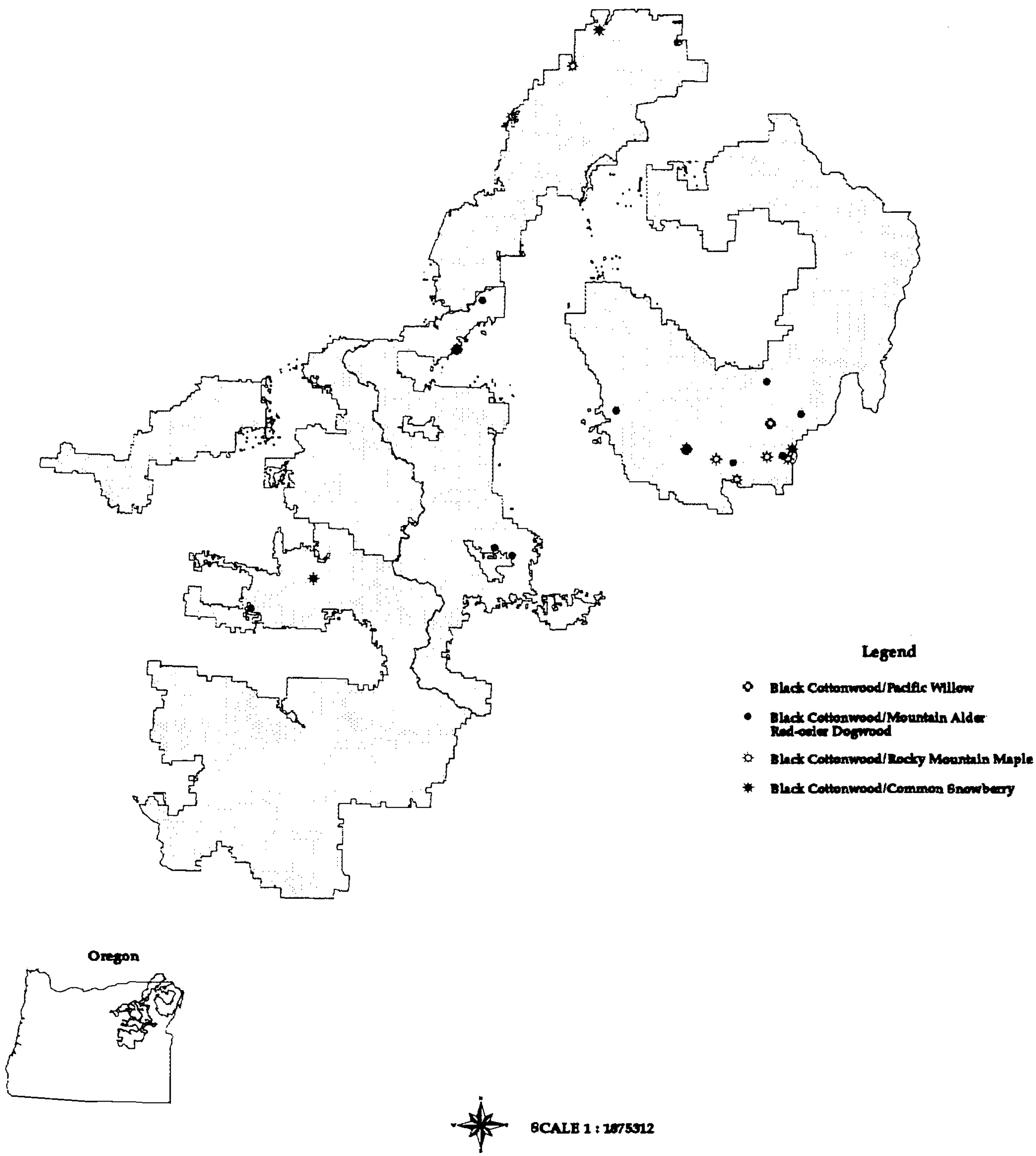
Overuse of cottonwood populations by livestock is a common problem in the Blue Mountain Province. Severe browsing and trampling by livestock and wild ungulates can prevent new stands from establishing on fresh scour or depositional surfaces, which leads to an unbalanced age structure in the population and eventual loss of cottonwood from the site. Species associated with drier black cottonwood associations and community types may provide abundant forage for livestock. Cottonwood stands provide food, cover and shade for many wildlife species. Meadow voles and mice feed on roots and the bark of young trees. Rabbits and hares clip branches and also feed on bark. Bald eagles, ospreys and blue herons nest in crowns, while cavities are used by woodpeckers, great horned owls, wood ducks, flying squirrels, raccoons and several songbird species. Large diameter cottonwood logs provide important wildlife habitat where other trees are scarce. Cottonwood enhances fish habitat in adjacent streams by stabilizing streambanks and by providing shade and large woody debris.

(Information taken from Braatne and others 1996, Schmitt 1996, Debell 1990 and Holifield 1990).

Figure 25. Facing page
Sample sites for black cottonwood types. This map does not represent the actual distribution of black cottonwood types.

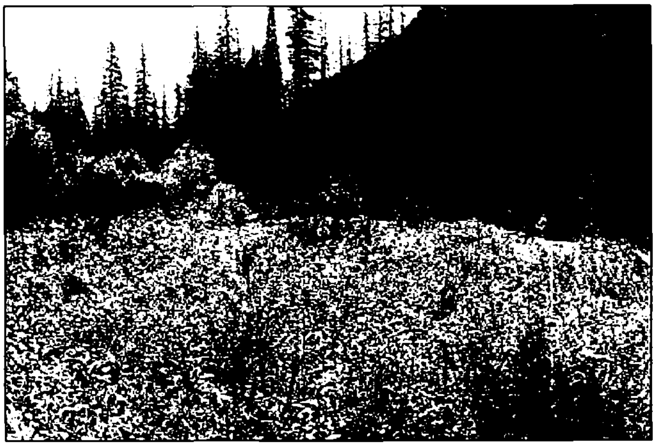
Black Cottonwood Plant Associations,

Community Types & Communities



Black Cottonwood/Pacific Willow Plant Association

Populus trichocarpa/Salix lasiandra HCS112
POTR2/SALA2 n=4

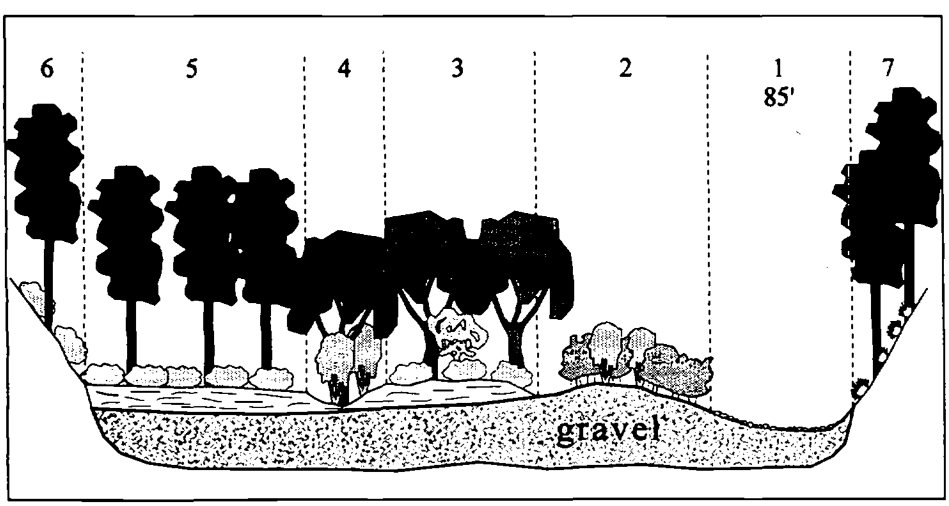


Valley Environment	Mean	S.D.
Elevation (ft.)	4133	755
Plot Aspect (°)	109	60
Plot Slope (%)	2	2
Valley Width (m)	200	–
Valley Gradient (%)	1	1
Valley Aspect (°)	122	33
Soil Surface Cover (%)		
Bare Ground	21	23
Gravel	2	2
Rock	20	25
Moss	9	14
Litter	49	35

Soil Profile Characteristics	
Bedrock/Parent Material(s)	mixed alluvium
Total Rooting Depth (cm)	30
Water Table Depth (cm)	35
Depth to Mottling (cm)	15
Depth to Redoximorphic Features (cm)	15
Surface Layer	
Thickness (cm)	0-15
Texture(s)	silt loam
Coarse Fragments (%)	0
Roots very fine: none	fine: many
medium: none	coarse: few
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	0-15
Texture(s)	silt loam
Coarse Fragments (%)	0
Roots very fine: none	fine: common
medium: none	coarse: few
Redoximorphic Features	some iron oxidation
Substrate	gravel, cobble

PHYSICAL ENVIRONMENT

The black cottonwood/Pacific willow community type was sampled on the La Grande and Pine RDs and in Hell's Canyon NRA (Wallowa-Whitman NF). The POTR2/SALA2 type is found on low to mid-elevation (3000-4500 feet) alluvial bars and in abandoned channels of major rivers and streams. Sampled sites are in broad (300-1000 feet), low gradient (1%-3%), trough- or flat-shaped valleys. This plant community develops on coarse alluvial deposits of sand, gravel, cobbles, and boulders. Soil surface cover approaches 50% bare ground, gravel, and rock in contrast to other black cottonwood communities described in this study. Stream reach types adjacent to sampled areas are C3, C4 and D3. Stream widths varied from 50-100 feet.



1 C4 stream reach
2 **Coyote willow**, point bar
3 **Black cottonwood/common snowberry**, floodplain
4 **Black cottonwood/Pacific willow**, overflow channel
5 **Ponderosa pine/common snowberry-floodplain**, inactive floodplain/terrace
6 Ponderosa pine/common snowberry, north-facing sideslope
7 Ponderosa pine/Idaho fescue-bluebunch wheatgrass, south-facing sideslope

Figure 26. *Grande Ronde River, La Grande RD, Wallowa-Whitman NF; mod. gradient, low elevation, trough-shaped valley; Mesic Forest Zone 1.*

VEGETATION COMPOSITION

Principal Species		Con	Cov
Dominant Overstory Trees			
POTR2	Black cottonwood	25	60
Subdominant Overstory Trees			
POTR2	Black cottonwood	100	27
PIEN	Englemann spruce	75	2
PSME	Douglas-fir	75	tr
PIPO	Ponderosa pine	50	6
ABGR	Grand fir	50	1
Tall Shrubs			
SALA2	Pacific willow	75	45
SARI	Rigid willow	75	4
Perennial Forbs			
ACMI	Yarrow	75	3
SOCA	Meadow goldenrod	75	1
TAOF	Common dandelion	50	3
CASTE	Paintbrush	50	2
ANMA	Pearly-everlasting	50	1
TRIFO	Clover	50	1
Perennial Grasses			
POPR	Kentucky bluegrass	75	8
AGST	Creeping bentgrass	50	16
ELGL	Blue wildrye	50	1
PHPR	Common timothy	50	1
Annual and Biennial Forbs			
VETH	Common mullein	75	1

Black cottonwood, Pacific willow, and rigid willow are pioneering trees and shrubs on coarse-textured alluvial surfaces along major rivers or streams. Most of the communities have cottonwood seedlings and saplings as potential overstory. One site was sampled with a mature cottonwood overstory in an abandoned channel. 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 1995). Shade-intolerant Pacific willow is usually well represented to abundant or rigid willow is well presented. Pioneering forbs are common; yarrow, meadow goldenrod, common dandelion, paintbrush, pearly-everlasting, and clover are constant associates. Kentucky bluegrass and creeping bentgrass are occasionally abundant. 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.

MANAGEMENT CONSIDERATIONS

Sites supporting the POTR2/SALA2 community type provide important habitat for a variety of wildlife species. Songbirds, beaver, and deer are primary users of this habitat (Uchytil 1989a). Domestic livestock may browse juvenile black cottonwood heavily (Hansen and others 1995). This community type aids stabilization of streamside soils. As stands representing this type mature, they may provide shade and woody debris to maintain fish habitat.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Seasonally Flooded.

OTHER STUDIES

Hansen and others (1995) described the Black Cottonwood/Recent alluvial bar Community Type in Montana that is closely associated with the POTR2/SALA2 community type.

Black Cottonwood/Mountain Alder-Red-osier Dogwood Plant Association

Populus trichocarpa/
Alnus incana-Cornus stolonifera HCS113
POTR2/ALIN-COST n=10

PHYSICAL ENVIRONMENT

This type was sampled on the Baker, La Grande, Pine and Wallowa Valley RDs and in Hell's Canyon NRA of the Wallowa-Whitman National Forest. It is found on low- to mid-elevation bars and floodplains. The POTR2/ALIN-COST plant association occurs in narrow to wide (60 to over 1000 feet) V- and flat-shaped valleys of 1-10% gradient. Soils consist of fine or coarse-textured alluvial deposits dominated by alluvium of coarse sand, gravel, cobbles, and boulders. These sites flood frequently; the water table retreats to a depth of 1-3 ft. during the growing season. Adjacent stream types are B3, B4, C3 and C5. Stream widths range from 5-30 feet.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4269	360
Plot Aspect (°)	225	66
Plot Slope (%)	4	3
Valley Width (m)	107	109
Valley Gradient (%)	4	3
Valley Aspect (°)	224	66
Soil Surface Cover (%)		
Bare Ground	8	11
Gravel	1	2
Rock	3	6
Moss	12	12
Litter	77	23

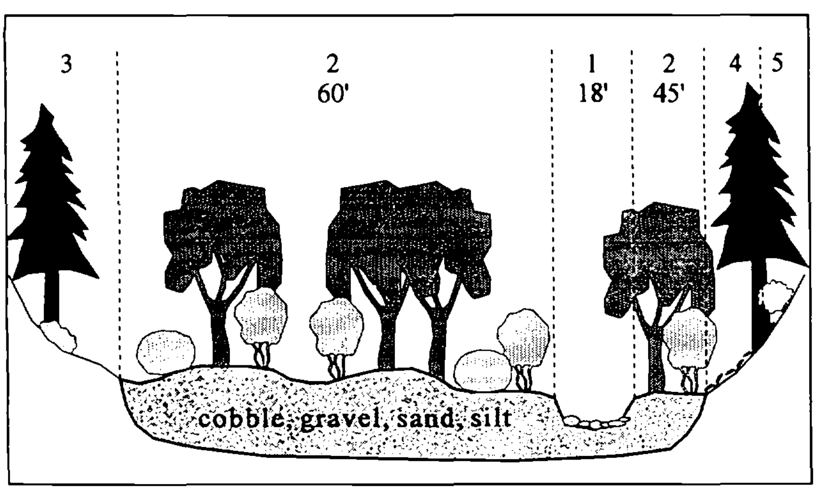
Soil Profile Characteristics

Bedrock/Parent Material(s): basalt, mixed sedimentary, mixed metamorphic, undifferentiated alluvium
Water Table Depth (cm): 25-64
Depth to Redoximorphic Features (cm): 16-25

Surface Layer
- Thickness (cm): 10-33
- Texture(s): silt loam, loam, sandy loam,sand
- Coarse Fragments (%): 0
- Roots: very fine: few to many; fine: many; medium: few to many; coarse: few to common
- Redoximorphic Features: none

Subsurface Layer(s)
- Thickness (cm): 0-54
- Texture(s): loam, sandy loam,sand
- Coarse Fragments (%): 10-30
- Roots: very fine: few to many; fine: few to many; medium: few to many; coarse: none to few
- Redoximorphic Features: gleying, common iron oxidation

Substrate: loam, sand, gravel, cobble



1. B3 stream reach
2. **Black cottonwood/mountain alder-red-osier dogwood,** floodplain
3. Grand fir/birchleaf spirea, west-facing sideslope
4. Grand fir/queen's cup beadlily, east-facing toeslope
5. Grand fir/big huckleberry, east-facing sideslope

Figure 27. *Clear Creek, Pine RD, Wallowa-Whitman NF; mod. high gradient, mod.. elevation, V-shaped valley; Mesic Forest Zone 2.*

VEGETATION COMPOSITION

Principal Species		Con	Cov
Dominant Overstory Trees			
POTR2	Black cottonwood	100	37
Subdominant Overstory Trees			
POTR2	Black cottonwood	30	11
Understory Trees			
ABGR	Grand fir	70	9
POTR2	Black cottonwood	50	3
PIEN	Engelmann spruce	40	2
Tall Shrubs			
COST	Red-osier dogwood	100	31
ALIN	Mountain alder	90	26
RILA	Prickly currant	90	3
SYAL	Common snowberry	80	9
AMAL	Amelanchior alnifolia	80	2
RUPA	Western thimbleberry	50	17
CRDO	Black hawthorn	50	4
Perennial Forbs			
GATR	Sweet-scented bedstraw	100	6
OSCH	Mountain sweet-cicely	80	2
VIGL	Stream violet	70	2
ACRU	Baneberry	70	1
HELA	Common cowparsnip	60	5
CIAL	Enchanter's nightshade	60	4
GEMA	Large-leaf avens	60	2
ANAR2	Sharptooth angelica	60	2
RUOC	Western coneflower	60	1
ACCO	Columbia monkshood	60	1
ASTER	Asters	60	1
TRCA3	False bugbane	50	24
ADBI	Trail plant	50	1
Perennial Grasses			
ELGL	Blue wildrye	70	1
CILA2	Drooping woodreed	50	4
Sedges and Rushes			
CADE	Dewey's sedge	50	4
Ferns and Horsetails			
EQAR	Common horsetail	60	17

The tree overstory is dominated by black cottonwood with scattered regeneration of both cottonwood and conifers. In the tall shrub layer, red-osier dogwood and/or mountain alder are abundant. Prickly currant, common snowberry, western serviceberry, western thimbleberry and black hawthorn are common. A diverse herbaceous understory may have sweet-scented bedstraw, mountain sweet-cicily, stream violet, baneberry, common cowparsnip, enchanter's nightshade, common horsetail, drooping woodreed, or Dewey's sedge as important components. Upland vegetation types adjacent to sites sampled are: terraces - grand fir/false bugbane, grand fir/common snowberry, other grand fir associations; sideslopes - grand fir/snowberry, grand fir/birchleaf spirea, grand fir/queen's cup beadlily, grand fir/pinegrass, and other grand fir associations.

MANAGEMENT CONSIDERATIONS

The POTR2/ALIN-COST plant association provides habitat for a diverse group of wildlife species. Red-osier dogwood is used for food and cover by deer, elk, rabbits and hares, beaver, bear, game birds, and songbirds (Crane 1989). Sprouts of this shrub are palatable to domestic livestock and overuse will remove red-osier dogwood from the community (Crane 1989 and Hansen and others 1995). This plant association, because of its streamside habitat, is an important source of shade, woody debris, and streambank stability for smaller streams of the study area.

Stand Characteristics

Species	*BA*	*Range*
POTR2	44	20-110
PIEN	45	10-80
ABLA2	30	—
ABGR	20	—
PIPO	20	—

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded to Intermittently Flooded.

OTHER STUDIES

This plant association is similar to the POTR2/COST plant association described for northeastern Washington by Kovalchik (1992), the POTR2-PIEN/ALIN-COST community type of central Oregon (Kovalchik 1987), and the black cottonwood/red-osier dogwood community type of Montana (Hansen and others 1995).

Black Cottonwood/Rocky Mountain Maple Plant Community Type

Populus trichocarpa/Acer glabrum HCS114
POTR2/ACGL n=6

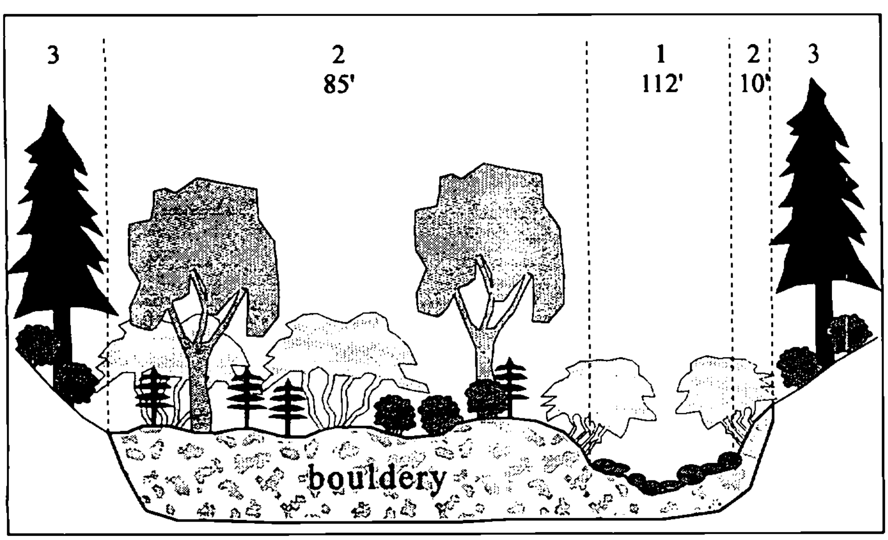
PHYSICAL ENVIRONMENT

The black cottonwood/Rocky Mountain maple community type was sampled in the northern portions of the Umatilla (Pomeroy and Walla Walla RDs) and Wallowa-Whitman (Pine RD) National Forests. It occurs on low to mid-elevation terraces and floodplains ranging from 2500-5500 feet. Most plots were in moderate to very high gradient (4% to 10%) V-shaped valleys of narrow to moderate width (60-300 feet). The POTR2/ACGL type is found on alluvial deposits of silt, sand, gravel, cobbles, and stones. The principal substrate was composed of sand and cobbles. Adjacent stream reach types were A2, B2, C3 and C4. Stream widths range from 5-50 feet.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	3833	1080
Plot Aspect (°)	99	61
Plot Slope (%)	6	3
Valley Width (m)	80	61
Valley Gradient (%)	5	2
Valley Aspect (°)	104	63
Soil Surface Cover (%)		
Bare Ground	1	1
Gravel	2	4
Rock	13	24
Moss	19	25
Litter	51	37

Soil Profile Characteristics

Bedrock/ParentMaterial(s)	basalt, mixed igneous extrusive, unk. metamorphic foliated
Total Rooting Depth (cm)	60
Water Table Depth (cm)	60
Depth to Redoximorphic Features (cm)	92
Surface Layer	
Thickness (cm)	0-10
Texture(s)	loam, sandy loam
Coarse Fragments (%)	1, gravel
Roots very fine: many	fine: many
medium: common	coarse: none
Redoximorphic Features	none
Subsurface Layer (s)	
Thickness (cm)	0-32
Texture(s)	loam, sandy loam
Coarse Fragments(%)	5-20, gravel
Roots very fine: many	fine: few to many
medium: few	coarse: few
Redoximorphic Features	none
Substrate Layer(s)	cobble



1 B2 stream reach
2 **Black cottonwood/Rocky Mtn. maple**, floodplain
3 Grand fir/big huckleberry, southwest- and northeast-facing sideslopes

Figure 28. *Lake Fork, Pine RD, Wallowa-Whitman NF; mod. high gradient, mod. high elevation, flat-shaped valley; Mesic Forest Zone 2*

VEGETATION COMPOSITION

Black cottonwood dominates the overstory tree layer in the POTR2/ACGL community type. Conifer species are regular components of sampled stands and dominate the lower tree layers. The constancy and abundance of grand fir regeneration indicates grand fir potential on the sites. This community type is probably seral to the grand fir/ Rocky Mountain maple plant association. Rocky Mountain maple typifies a diverse tall shrub layer of common snowberry, western serviceberry, western thimbleberry, red-osier dogwood, and black hawthorn. While the herb layer consists of many mesic-site species, most have low abundance individually and are poorly represented. Mountain sweet-cicely, trail plant, stream violet, sweet-scented bedstraw, western coneflower (an increaser), and Hooker's fairy-bells are the most constant. Columbia brome and blue wildrye are important grass species encountered. Upland vegetation types adjacent to sites sampled are: sideslopes - grand fir/big huckleberry, grand fir/Rocky Mountain maple-mallow ninebark, grand fir/birchleaf spirea, grand fir/Rocky Mountain maple, other grand fir associations and Douglas fir/mallow ninebark.

Principal Species		**Con**	**Cov**
Dominant Overstory Trees			
POTR2	Black cottonwood	100	25
PSME	Douglas-fir	50	9
Subdominant Overstory Trees			
POTR2	Black cottonwood	67	10
ABGR	Grand fir	50	5
Understory Trees			
ABGR	Grand fir	100	13
Tall Shrubs			
ACGL	Rocky Mountain maple	100	29
SYAL	Common snowberry	83	36
AMAL	Western serviceberry	83	4
RUPA	Western thimbleberry	50	23
COST	Red-osier dogwood	50	11
CRDO	Black hawthorn	50	6
RILA	Prickly currant	50	1
Perennial Forbs			
OSCH	Mountain sweet-cicely	83	1
ADBI	Trail plant	67	1
VIGL	Stream violet	67	1
GATR	Sweet-scented bedstraw	67	1
URDI	Stinging nettle	67	tr
RUOC	Western coneflower	50	14
DIHO	Hooker's fairy-bells	50	1
Perennial Grasses			
ELGL	Blue wildrye	67	1
BRVU	Columbia brome	50	7
Sedges and Rushes			
CADE	Dewey's sedge	50	1

MANAGEMENT CONSIDERATIONS

Rocky Mountain maple is an important browse species for wild ungulates and provides food and cover for birds, squirrels, and chipmunks (Uchytil 1989b). Associated shrubs, while not as abundant, provide similar habitat elements for wildlife needs. Black cottonwood is an important community element as habitat for a variety of wildlife. Fire and silviculture may be used in this type to arrest the natural forces of succession for wildlife benefit.

Stand Characteristics

Species	*BA*	*Range*
POTR2	39	10-120
ABGR	24	15-40
PICO	20	—
PIEN	10	—
PIPO	10	—

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded to Intermittently Flooded.

OTHER STUDIES

Kovalchik (1992) identifies a miscellaneous plant association, POTR2/ACGL. It appears similar but is not fully described in his draft classification for eastern Washington.

Black Cottonwood/Common Snowberry Plant Community Type

Populus trichocarpa/Symphoricarpos albus HCS311
POTR2/SYAL n=5

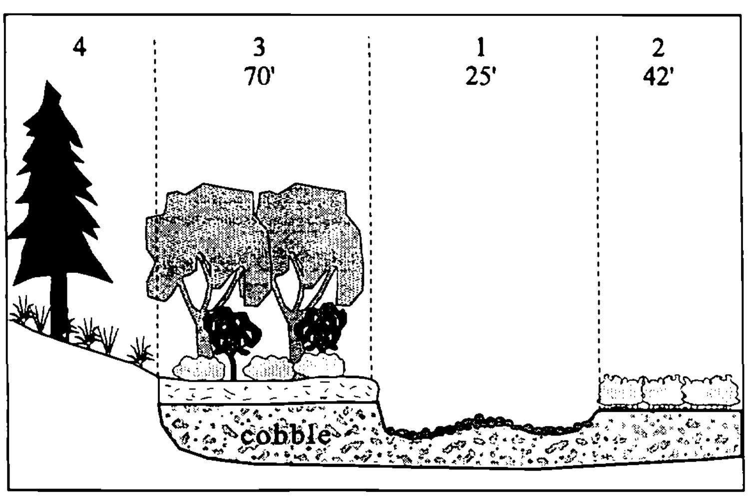
PHYSICAL ENVIRONMENT

This type occurs on low elevation, gentle terraces along major rivers and streams in the central and northern portion of the study area (sampled on Long Creek RD, Malheur NF; Pomeroy RD, Umatilla NF; La Grande, Pine, Hell's Canyon NRA RDs, Wallowa-Whitman NF). Valley widths are usually broad (300-1000 ft.), but this type has been sampled in moderate width valleys of 100 feet. Valleys are V-, flat- and trough-shaped with moderate gradients (2-5%) and often steep sideslopes. The POTR2/SYAL community occupies deep alluvial soils of fine-textured surface horizons with sand, gravel, and rocks below. Sites are flooded infrequently, and the water table was below soil depths sampled on study plots. Mottling was evident, however, in one profile. Plots occurred adjacent to B2, B3, C4, and D3 stream reach types. Stream widths range from 5-100 feet.

Valley Environment	Mean	S.D.
Elevation (ft.)	3700	480
Plot Aspect (°)	116	67
Plot Slope (%)	3	2
Valley Width (m)	137	88
Valley Gradient (%)	3	1
Valley Aspect (°)	118	55
Soil Surface Cover (%)		
Bare Ground	2	4
Moss	2	4
Litter	95	5

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, andesite, mixed alluvium
Total Rooting Depth (cm)	23-31
Surface Layer	
Thickness (cm)	18-69
Texture(s)	silt loam, fine sandy loam, medium sandy loam
Coarse Fragments (%)	0-55, gravel
Roots	very fine: common to many; fine: few to many; medium: none to common; coarse: none to common
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness(cm)	0-15
Texture(s)	silt loam
Coarse Fragments (%)	0-10, gravel
Roots	very fine: none to many; fine: few to many; medium: none to common; coarse: few to common
Redoximorphic Features	none
Substrate	gravel, cobble, boulders



1 D3 stream reach
2 **Coyote willow**, alluvial bar
3 **Black cottonwood/common snowberry**, inactive floodplain
4 Grand fir/pinegrass, west-facing sideslope

Figure 29. *East Eagle Creek, Pine RD, Wallowa-Whitman NF; mod. gradient, mod. elevation, flat-shaped valley; Mesic Forest Zone 2.*

VEGETATION COMPOSITION

Black cottonwood dominates a tree overstory with conifers present in all layers. While irregular in occurrence, the conifer species (PIPO, PSME, ABGR) may indicate community potential on these terrace sites. The shrub component is dominated by common snowberry with scattered black hawthorn and western serviceberry creating a diverse shrub canopy beneath the cottonwood. The black hawthorn is seral in this community but may form climax riparian stringers at lower elevations in the study area. Starry false-Solomon's seal is a regular member of the herbaceous understory. Less common in occurrence is butterweed groundsel, cowparsnip, sweet-scented bedstraw, and western meadowrue. Kentucky bluegrass, blue wildrye, and red fescue are abundant where they occur in the understory. 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.

Principal Species		**Con**	**Cov**
Dominant Overstory Trees			
POTR2	Black cottonwood	100	56
Subdominant Overstory Trees			
POTR2	Black cottonwood	40	3
PIPO	Ponderosa pine	40	2
Understory Trees			
ABGR	Grand fir	60	4
POTR2	Black cottonwood	40	1
Tall Shrubs			
SYAL	Common snowberry	100	44
CRDO	Black hawthorn	100	32
AMAL	Western serviceberry	60	5
ROWO	Wood's rose	40	3
Perennial Forbs			
SMST	Starry false-Solomon's seal	100	17
SEFO	Butterweed groundsel	60	6
HELA	Common cowparsnip	60	5
GATR	Sweet-scented bedstraw	60	3
THOC	Western meadowrue	40	39
FRVE	Woods strawberry	40	2
OSCH	Mountain sweet-cicely	40	2
Perennial Grasses			
POPR	Kentucky bluegrass	60	27
ELGL	Blue wildrye	60	23
FERU	Red fescue	40	45
BRVU	Columbia brome	40	4
Sedges and Rushes			
CADE	Dewey's sedge	40	7

MANAGEMENT CONSIDERATIONS

The shrub understory of this community type provides nesting habitat and food for both nongame and game birds while the overstory is used by woodpeckers, raptors, and other bird species for foraging, nesting, and roosting (Snyder 1991). Understory cottonwood and shrubs are browsed by both domestic and wild ungulates. Continuous and severe grazing results in a decline in the snowberry component while Kentucky bluegrass increases in abundance.

Stand Characteristics

Species	*BA*	*Range*
POTR2	87	40-120
ABGR	25	20-30
PIPO	20	—
PSME	20	—

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Intermittently Flooded.

OTHER STUDIES

The similar POTR2/SYAL/POPR community type is described for central Oregon as successional to ponderosa pine (Kovalchik 1987). It may occur over broader habitats in our study area.

General Managment Considerations for Red Alder

Red alder (*Alnus rubra*) grows in humid climates characterized by cool, wet winters and warm, dry summers. This species is generally considered to occur in Cascadian and Pacific Coastal environments. It is found in the Blue Mountains, however, on the Walla Walla RD (Umatilla NF). It was sampled for this classification in the Mill Creek, Walla Walla River and Umatilla River drainages in riparian settings. The best stands develop on deep, well-drained loam or sandy loam, but this species can tolerate poor drainage and some flooding. Red alder reaches sexual maturity at 3 to 8 yrs. of age. It is monoecious. Male and female catkins develop on the previous year's twigs. Male flowers hang in pendulous clumps, while female catkins are in upright clumps. Flowering occurs in late winter and early spring. This species is a consistent and prolific producer of seeds. Bumper crops occur every 3 to 5 years. Seed dispersal occurs in late fall and winter. Most seeds are disseminated by wind and water. Seeds germinate well on moist mineral substrate in full sunlight. Fresh flood deposits in open areas provide excellent germination sites. Height growth of seedlings is exceptionally fast: 3 ft. or more the first year and 1.5 ft. the second year. Two to five year old seedlings can be 9 ft. tall. Height growth continues until the soil moisture, air temperature or light conditions on the site are unfavorable. On good sites mature trees can attain heights of 30 ft. in 5 years, 50 ft. in 10 years, 80 ft. in 20 years and 100 to 130 ft. at maturity. Red alder is relatively short-lived, maturing in 60 to 70 years and reaching maximum age in 100 years. Roots rapidly develop into an extensive fibrous system and commonly develop ectomycorrhizal relationships with only a few fungal species. The roots also develop nitrogen-fixing nodules soon after germination. On mature trees, nodules are found on large woody roots and smaller new roots and can be as large as 3-3.5 inches in diameter. Red alder requires more light than any of its tree associates except black cottonwood. Competition among saplings causes rapid self-thinning. Stand densities decrease from approx. 50,000 seedlings/acre at age 5 to 675 trees/acre at age 20. Trees self-prune well. Live crown ratios in crowded stands are low; crowns are characteristically narrow and dome-like. Red alder can be regenerated by any method that provides full sunlight and exposed mineral soil. Fire can probably substitute for mechanical disturbance of soils.

Red alder is fairly free of most insect and disease problems, especially when it is young and uninjured. In older trees the major cause of rot and mortality is white heart rot (*Phellinus ignarius*). There are also some canker-causing stem diseases that affect red alder, but they are not serious. Insects that have been found on red alder in the Northwest are the alder woolly sawfly (*Eriocampa ovata*), the striped alder sawfly (*Hemichroa crocea*), the alder flea beetle (*Altica ambiens*) and the alder aphid (*Pterocaulis alni*). Ice storms or unseasonable frost can cause mortality and/or top damage. Windthrow is not common because of the relatively deep root system, the absence of leaves in winter when soils are saturated and the intermingling of roots and branches.

Fire rarely occurs in red alder stands because of the moist soils and scarcity of flammable fuels. Red alder bark is thin but resistance enough to prevent damage to the trees during light surface fires. Trees can sprout at the root collar after cutting and perhaps after fire, although information about the effects of fire is lacking.

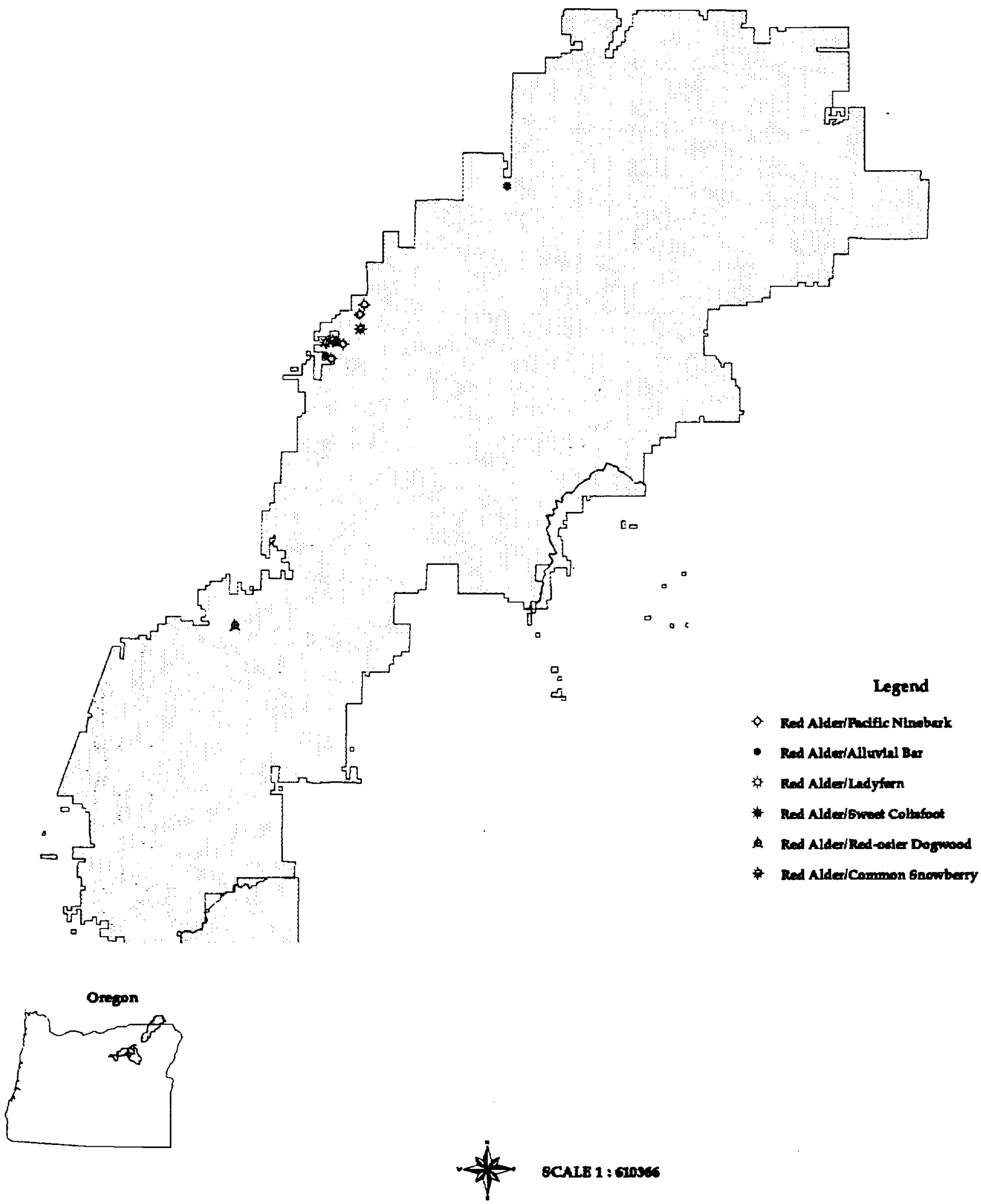
Deer and elk eat leaves, twigs and buds of young red alder trees from fall through early spring. Beavers build dams and lodges with stems and eat the bark. Goldfinches, siskins and deer mice eat the seeds. Young red alder leaves and twigs are considered fair browse for cattle and sheep. Young red alder stands provide good cover for mule deer.

(Information taken from Harrington 1990 and Uchytil 1989c.)

Figure 30. Facing page
Sample sites for red alder types. This map does not represent the actual distribution of red alder types.

Red Alder Plant Associations,

Community Types & Communities



Red Alder/Pacific Ninebark Plant Association

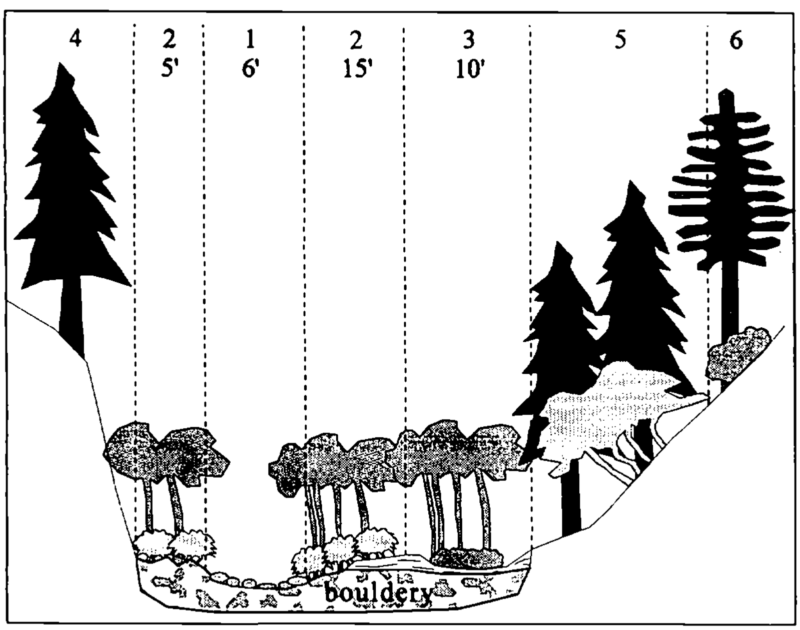
Alnus rubra/Physocarpus capitatus HAS211
ALRU/PHCA3 n=5

PHYSICAL ENVIRONMENT

This community type occurs on the northern portion of the Umatilla National Forest (Walla Walla RD). It was sampled at elevations from 2500-3200 feet on bars and floodplains of major rivers and streams. Valleys are characteristically V-shaped, very narrow to broad in width (15 to 650 feet), and intermediate in gradient, ranging from 2% to 7%. Soils are developing in alluvial silt and sand over gravel, cobbles, and stones. Depths to the coarse alluvium vary from 5 to 13 inches. Adjacent stream reach types identified were B2, B3, and B4 types. Stream widths are 5 to 50 feet.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	2866	238
Plot Aspect (°)	250	37
Plot Slope (%)	5	2
Valley Width (m)	62	80
Valley Gradient (%)	5	3
Valley Aspect (°)	266	42
Soil Surface Cover (%)		
Submerged	2	3
Bare Ground	1	1
Gravel	1	2
Rock	4	4
Moss	34	39
Litter	58	35

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt
Total Rooting Depth (cm)	13-33
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	
Texture(s)	gravel, cobble



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 Mtn. maple, south-facing toeslope
6 Douglas-fir/common snowberry, south-facing sideslope

Figure 31. *Tiger Creek, Walla Walla RD, Umatilla NF; mod. high gradient, mod. low elevation, V-shaped valley; Mesic Forest Zone 2.*

VEGETATION COMPOSITION

Red alder dominates the overstory tree layer of the ALRU/PHCA3 type. The tall shrub layer consists 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, cool-wort foam-flower, starry false-Solomon's seal, alpine mitrewort, trail plant, nodding fescue, and Dewey's sedge. Upland vegetation types adjacent to plots sampled are: terraces - grand fir/Pacific ninebark (undescribed); 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).

Principal Species		**Con**	**Cov**
Dominant Overstory Trees			
ALRU	Red alder	100	69
Subdominant Overstory Trees			
ALRU	Red alder	20	5
Understory Trees			
ABGR	Grand fir	80	tr
ALRU	Red alder	40	3
Tall Shrubs			
PHCA3	Pacific ninebark	100	41
PHLE2	Lewis' mock-orange	100	5
SYAL	Common snowberry	80	4
RUPA	Western thimbleberry	60	6
RHPU	Cascara	60	2
ACGL	Rocky Mountain maple	40	23
Perennial Forbs			
DIHO	Hooker's fairy-bells	100	4
GEMA	Large-leaf avens	80	15
TITRU	Cool-wort foam-flower	80	12
SMST	Starry false-Solomon's seal	80	3
MIPE	Alpine mitrewort	80	2
MOCO	Heart-leaved miner's-lettuce	80	1
ADBI	Trail plant	60	15
ASCA3	Wild ginger	60	4
TRCA3	False bugbane	40	8
URDI	Stinging nettle	40	3
STAM	Clasp-leaf twistedstalk	40	2
Perennial Grasses			
FESU	Nodding fescue	80	6
ELGL	Blue wildrye	60	5
CILA2	Drooping woodreed	40	40
Sedges and Rushes			
CADE	Dewey's sedge	80	12
Ferns and Horsetails			
ATFI	Lady fern	60	6
GYDR	Oak fern	40	20

MANAGEMENT CONSIDERATIONS

Red alder stands of the Blue Mountain Province are restricted to riparian habitat. In such areas, alder's ability to fix nitrogen and its shade intolerance favor red alder establishment on recent alluvium, a bare substrate with low nutrient content. Nitrogen accretion and the incorporation of nitrogen-rich leaf litter improve the capability of these areas to support a diverse plant community and associated wildlife species. Young stands provide fair browse for deer and elk. Beaver use red alder as food and building material for dams and lodges. Alder seed is an important food source for songbirds and small mammals (Uchytil 1989c). Fish habitat is improved by the shading of streams from riparian red alder stands and by woody debris recruitment in streams.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Forested Wetland, SUBCLASS Needle-leaved Evergreen, WATER REGIME (NONTIDAL) Temporarily Flooded.

OTHER STUDIES

The ALRU/PHCA3 community type has not been previously described.

Miscellaneous Red Alder Types

Red Alder/Alluvial Bar Plant Community Type

Alnus rubra/Alluvial bar
ALRU/ALLUVIAL BAR n=2

The ALRU/ALLUVIAL BAR community type was sampled twice in the northern half of the Umatilla NF (Pomeroy and Walla Walla RDs). Red alder (ALRU) dominates the tree layer on some gravel and cobble bars with creeping buttercup (RARE) abundant and dominating the understory. Scattered shrubs of common snowberry (SYAL), red-osier dogwood (COST), Rocky Mountain maple (ACGL), currants (RIBES), and Lewis' mock-orange (PHLE2) may be common. These low-elevation sites represent early-seral stands that will develop into ALRU/COST, ALRU/SYAL, ABGR/ACGL or other types. The stream reach type adjacent to sampled sites is B3.

Red Alder/Lady Fern Plant Community Type

Alnus rubra/Athyrium filix-femina
ALRU/ATFI n=2

Two plots sampled on the Walla Walla Ranger District (Umatilla NF) represent streamside habitats or wet seeps in which lady fern is a prominent understory plant beneath a dense canopy of red alder. These occur on low elevation sites in low gradient valleys of various sizes. Adjacent stream reaches on sites sampled were B3 and B4. Lady fern (ATFI) is abundant with a mean of 38% canopy coverage. Other important understory species include: wild ginger (ASCA3), cool-wort foam-flower (TITRU), alpine mitrewort (MIPE), Pacific ninebark (PHCA3), common snowberry (SYAL), and red-osier dogwood (COST). 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).

Red Alder/Sweet Coltsfoot Plant Community Type

Alnus rubra/Petasites frigidus palmatus HAF211
ALRU/PEFRP n=2

The ALRU/PEFRP community type was sampled on the Walla Walla Ranger District of the Umatilla National Forest. Valleys are moderately wide and V-shaped with 2-7% gradients with steep sideslopes. Adjacent stream reach types were B4 and C3b. Red alder (ALRU) provided all the tree coverage with sweet coltsfoot (PEFRP) coverage of 55%. Other herbaceous species of importance are alpine mitrewort (MIPE), stinging nettle (URDI), large-leaf avens (GEMA), nodding fescue (FESU), and Dewey's sedge (CADE). The shrub layer characteristically has Rocky Mountain maple (ACGL), western thimbleberry (RUPA), and Lewis' mock-orange (PHLE2) at low abundances. Adjacent upland vegetation types are: terraces - grand fir/Pacific ninebark (undescribed); sideslopes - grand fir/swordfern-wild ginger, grand fir/Pacific ninebark. Diaz and Mellon (1996) describe a red alder/sweet coltsfoot plant community that has similar dominant species but dissimilar associated species composition.

Red Alder/Red-osier Dogwood Plant Community

Alnus rubra/Cornus stolonifera
ALRU/COST n=1

A streamside floodplain at 2500 feet elevation on the Walla Walla Ranger District (Umatilla NF) supported a dense community of red alder (ALRU) and red-osier dogwood (COST). The site is coarse alluvium with a depth of 13 cm to cobbles of the old streambed. The stream reach was a B3. Associated species include western thimbleberry (RUPA), common cowparsnip (HELA), heart-leaved miner's-lettuce (MOCO), wild ginger (ASCA3), and Dewey's sedge (CADE).

Red Alder/Common Snowberry Plant Community Type

Alnus rubra/Symphoricarpos albus
ALRU/SYAL n=2

Two low elevation terrace plots on the Walla Walla RD (Umatilla NF) were used to describe this community. Adjacent stream reaches were B4 and B6. A red alder (ALRU) tree layer overtops the shrub layer composed principally of common snowberry (SYAL) (75% canopy coverage). Black hawthorn (CRDO) and Lewis' mock-orange (PHLE2) are well represented. Large-leaf avens (GEMA), starry false-Solomon's seal (SMST), and Dewey's sedge (CADE) are important herbaceous species. This site may represent plant communities transitional to conifer dominance on drier terrace locations.

General Management Considerations for

Undergreen Willow, Geyer Willow, Booth Willow, Lemmon Willow, Bebb Willow, Bog Birch, Rigid Willow, Pacific Willow and Coyote Willow

The willow species important in this classification are shade intolerant and fall into three general ecological categories: 1. the "cold" group, often referred to as low willows because of their generally shorter stature, composed of undergreen willow (*Salix commutata*), Eastwood willow (*Salix eastwoodiae*) and Tweedy's willow (*Salix tweedyi*); 2. the general, most widespread group, often referred to as tall willows, found mainly in Continental Zone of the Blue Mountains Province and composed of Geyer willow (*Salix geyeriana*), Booth willow (*Salix boothii* - identified in Flora of the Pacific Northwest as *Salix myrtillifolia*), Lemmon willow (*Salix lemmonii*), Bebb willow (*Salix bebbiana*) and occasionally rigid willow (*Salix rigida*); and 3. the "alluvial bar" group, composed of rigid willow (*Salix rigida*), Pacific willow (*Salix lasiandra*) and coyote willow (*Salix exigua* ssp. *exigua* and ssp. *melanopsis*). All willow species are dioecious, i.e. male and female flowers are formed on separate plants. Flower structures are known as catkins. Catkin length varies among species, but all are made up of a "spike" of flowers. Male catkin flowers contain stamens; female catkin flowers form capsules that contain numerous tiny seeds. Attached to these seeds are fluffy hairs that provide the seeds with tremendous buoyancy in wind and on water. Pollination of willows is by insects, primarily bees. Flowering occurs in spring and early summer. Seeds are shed in mid to late summer. All of these willow species can propagate vegetatively through the rooting of broken stem and root pieces that are partially buried by flood deposits or in beaver dams. Identification of willows is based primarily on leaf, stem and female catkin characterisitics. For those unfamiliar with willows, collection of mature female catkins is recommended for proper identification. With practice many species are recognizable by leaf and twig characteristics alone. Willow communities should not be considered potential natural vegetation throughout the Blue Mountains province. Many riparian areas are potential alder or conifer association sites, especially on higher gradient and/or shade streams.

The cold willow group is generally found at high elevations (or occasionally in cold air drainages at lower elevations) and on soils that are often saturated throughout the growing season. Undergreen willow usually occurs on Histosols, with thick organic profiles one meter or more deep. Eastwood and Tweedy's willows occur more often on moist to wet, coarse-textured mineral soils. Little information is available on autoecological characteristics of these species and about the effects of fire, grazing and browsing on growth and reproduction. Although most willow species need mineral seedbeds for successful germination, undergreen willow may be able to germinate on organic soils and presumably tolerates mild to moderately high acidity.

The general willow group (SALIX in this classification) also include bog birch (*Betula glandulosa*), which certainly has a different distribution throughout North America than the willow species in the group but was usually sampled in association with these species. This group occurs primarily adjacent to C, E and F stream types with gravel, sand and silt beds. SALIX group habitat is most prevalent in the Continental climate zone of the southern Malheur and Wallowa Whitman Forests and in the larger Blue Mountain basins (e.g. Whitney Valley, Baker Valley, Ukiah Valley, etc.) Further study may lead to separation of bog birch into distinct vegetation types. Geyer willow can reach heights of 20 ft. Booth willow reaches heights of 9-18 ft. and has a rounded form. Stems begin to senesce at 15 to 20 yrs. Booth, Geyer and Bebb willows begin producing seed at 2 to 10 yrs. of age. Flowering occurs in May and June and seed dispersal in late June and early July. Germination takes place within 24 hours once seeds have reached a moist, favorable seedbed. Seedling establishment is inhibited by dense litter. Booth willow seeds germinate under a wide temperature range: 41 to 77° F. Booth willow is intolerant of drought but is highly tolerant of frost and flooding. Growth is limited, however, if water covers the root crown for extended periods. Geyer willow seeds contain chlorophyll and can begin photosynthesizing when moistened. Bebb willow seeds need a moist, mineral substrate, full sunlight and warm temperatures for germination. Bebb and Booth willows grow best on neutral to slightly alkaline soils (pH 5.5 to 7.5). They are intolerant of acid soils. Bebb willow can reproduce by layering if branches are buried by flood deposits. Bebb willow is also intolerant of drought. Geyer willow appears to be able to grow on somewhat drier sites than Bebb and Booth willow. Lemmon willow has characteristics similar to Geyer willow. Bog birch is monoecious. Male flowers form catkins during the growing season, which overwinter on the shrub and shed pollen the following spring. Female flowers appear with the leaves in the spring. Once pollinated they become cone-like. Seeds are dispersed in the fall by wind and require winter stratification before germinating in the spring. They probably lose their viability if germination does not occur within one to two years. Bog birch has very high frost tolerance and moderate to high shade tolerance. It also has low nutritional requirements and can grow on nutrient-poor, acidic soils in some locations. Establishment of shrubs in this general willow group is primarily on fresh mineral substrates composed of silt, sand and/or gravel. Many plants will be established close to the edge of the stream channel, thus forming "galleries" across the valley somewhat similar to the black cottonwood galleries described earlier in this document. Determining whether a site has a sedge association potential or a willow/sedge association potential may be difficult. In broad, flat basins or valleys with E5 or E6 stream reaches and where flood energy is highly dissipated as water leaves the channels, potential vegetation may be limited to sedge associations. These streams provide little scour or sediment deposition sites necessary for willow establishment. As stream pattern, gradient, sediment supply, and hydrographs change (usually resulting in a change in stream type, e.g. C to E, C to F or E to G) potential vegetation may also change.

The alluvial bar willow group is found, as the name implies, on coarse-textured sand, gravel and cobble bars. These bars are small to large in size and occur on several different stream reach types: generally B, C and D types with cobble, gravel or sand beds. Coyote willow is unique among the willows described here in that it is rhizomatous. Numerous slender stems arise from an extensive underground root system to form male and female clones. It tends to form thickets (generally 3-10 ft. in height) and is an excellent stabilizer of the coarse-textured substrates on which it is found. Seed viability is about one week. Seeds germinate within 24 hours of landing on fresh, mineral substrates. Rigid willow can attains heights of 23 ft. and stem diameters of 8 in. Seeds are viable for only a few days and will germinate within 12 to 24 hours of landing on a moist, mineral seedbed. Pacific willow attains heights of 20+ ft. depending on elevation. Seeds of rigid and Pacific willow contain chlorophyll and can begin photosynthesizing as soon as they are moistened. Coyote and Pacific willows are very tolerant of flooding, are seldom found on drier, fine-textured floodplain surfaces and are very shade intolerant. Rigid willow can occur as a component of the general willow group and may be more tolerant of light shade and drier soils.

Geyer willow and Bebb willow are more palatable to livestock and wild ungulates than Booth willow, but the latter is still highly palatable to deer, elk, and beaver. Bog birch is not heavily used by cattle but appears to be relished by elk and mule deer. Overbrowsed willows will lose their vigor and stand density. Older age classes will dominate and plants will show highlining or dead stems or severe hedging. Excessive browsing of willows in the winter can reduce seed production by removing flower buds developed in the fall and stimulating the plant to put more energy into vegetative growth rather than reproductive growth. Willow plantings need at least three years, and decadent plants at least 5-6 years, rest from browsing in order to become established or recover their vigor.

All of these willow species and bog birch are well-adapted to fire. When a light to moderate fire kills the above-ground plant parts, these shrubs will resprout from the roots, root crowns, or basal stems. All of the willow species produce numerous seeds that can germinate on burned areas. Hot fires that burn the upper organic layers of the soil can expose the roots of the shrubs and kill the plants.

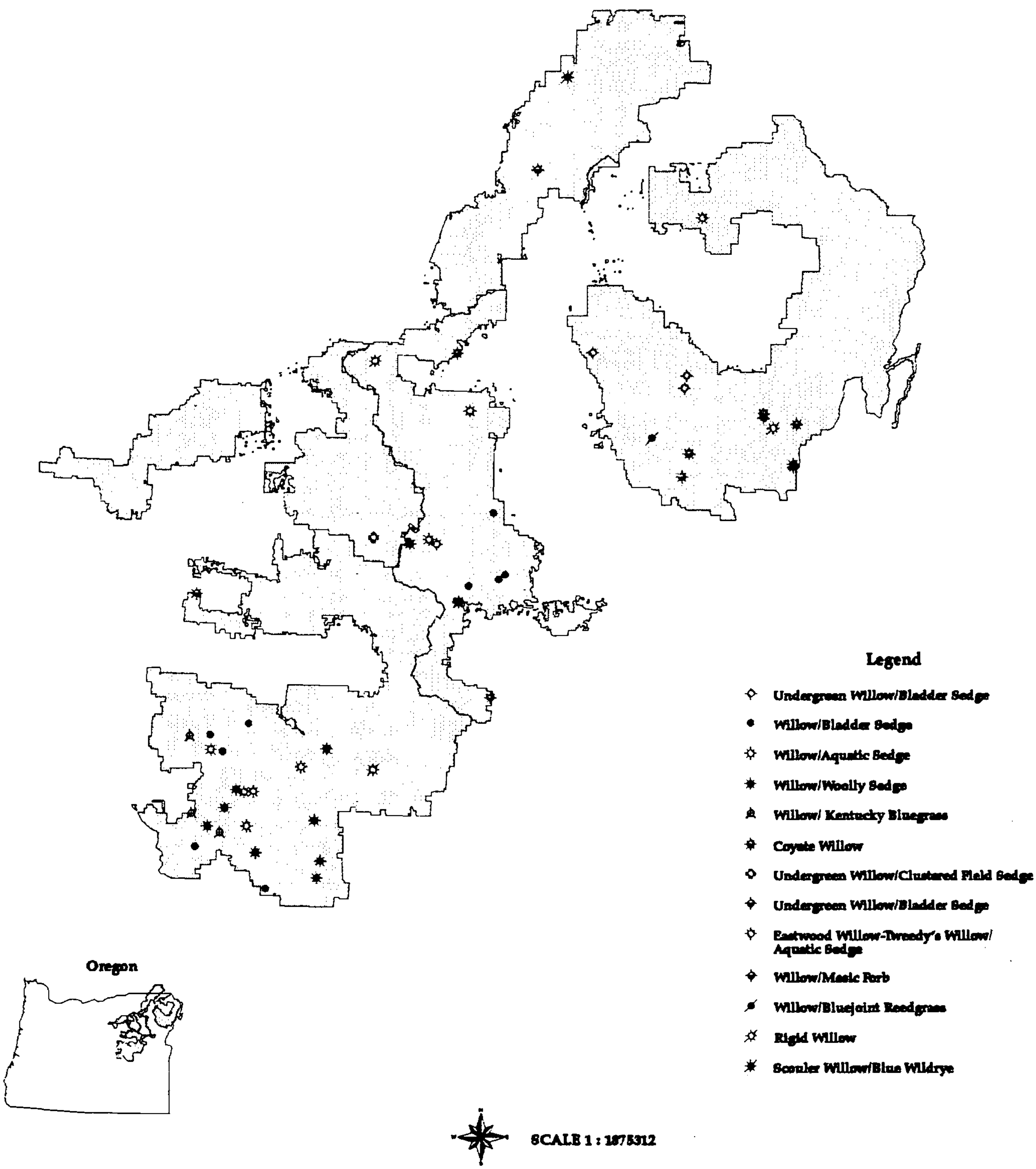
Snowshoe hare feed heavily on bog birch in some areas. Bog birch catkins, buds, and seeds are eaten by sharp-tailed grouse, spruce grouse, ruffed grouse, pine siskin, chickadees, and kinglets. All of the willow species are preferred food and building material of beaver. Ducks, grouse, other birds, and some small mammals eat willow shoots, buds, leaves, and catkins. Willows and bog birch provide good nesting, foraging, and cover for birds and small mammals. Healthy (i.e., tall and abundant) willow stands are also excellent habitat for deer. Willows provide good shade and bank stabilization for streams.

(Information taken from Brunsfeld and Johnson 1985, Esser 1992, Tesky 1992a and Uchytil 1991d, 1989a, 1989d, and 1989e.)

Figure 32. Facing page
Sample sites for willow types.
This map does ot represent actual distribution of willow types.

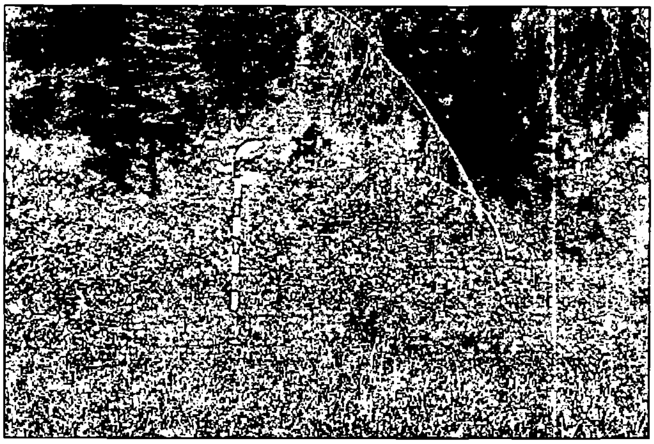
Willow Plant Associations,

Community Types & Communities



Undergreen Willow/Holm's Sedge Plant Association

Salix commutata/Carex scopulorum SW1121
SACO2/CASC5 n=4



PHYSICAL ENVIRONMENT

The SACO2/CASC5 association was sampled on the La Grande and Eagle Cap RDs (Wallowa-Whitman NF). It is found on seep slopes and in wet meadows at high elevations (6460-7700 ft.). Soils are cold, organic Borohemists and Borosaprists that are saturated for most or all of the growing season, although standing water is seldom seen on the surface. One site was adjacent to a B3 stream reach.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	6893	586
Plot Aspect (°)	9	35
Plot Slope (%)	19	21
Valley Width (m)	65	-
Valley Gradient (%)	5	-
Valley Aspect (°)	330	-
Soil Surface Cover (%)		
Submerged	6	9
Bare Ground	3	3
Moss	54	35
Litter	17	23

Soil Profile Characteristics

Bedrock/Parent Material(s) organics, basalt, quartz diorite
Water Table Depth (cm) 0-42
Total Rooting Depth (cm) 13-40

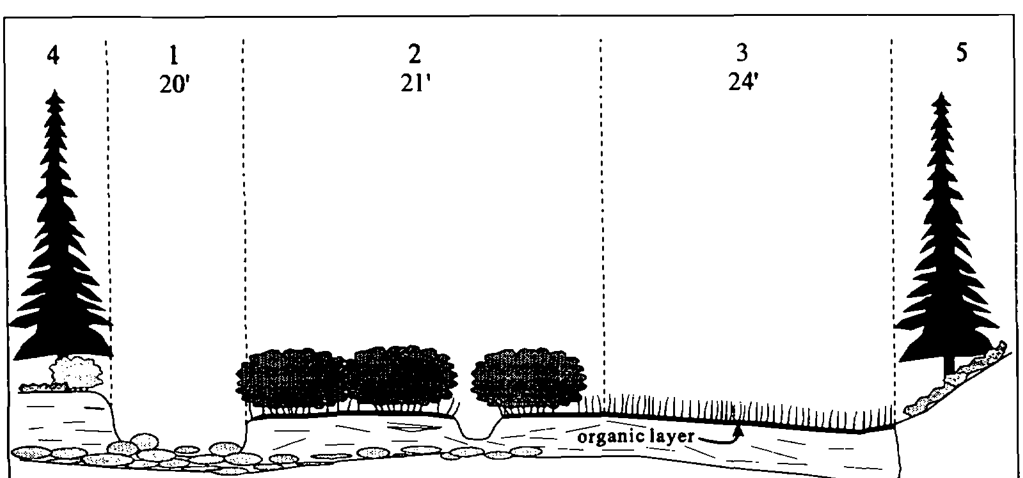
Surface Layer

Thickness (cm) 3-13
Texture(s) fibric, hemic organic
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) 29-51+
Texture(s) sapric-hemic organic, medium sand, organic silt
Coarse Fragments (%) 0
Roots very fine: many fine: common to many
medium: none coarse: none
Redoximorphic Features none

Substrate organics, granite sand



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

Figure 33. *East Lostine River, Eagle Cap RD, Wallowa-Whitman NF; mod. gradient, high elevation, U-shaped valley; Mesic Forest Zone 2.*

VEGETATION COMPOSITION

Undergreen willow forms a scattered to moderately dense shrub overstory (3-6 ft. tall) with a dense layer of Holm's sedge, scattered forbs and graminoids in the understory. There is generally continuous or at least very extensive cover by mosses. Vegetation types adjacent to sites sampled are: sideslopes - subalpine fir/grouse huckleberry, subalpine fir/Labrador tea-grouse huckleberry, other subalpine fir associations.

Principal Species		Con	Cov
Shrubs			
SACO2	Undergreen willow	100	65
Perennial Forbs			
ARCH	Leafy arnica	75	8
SETR	Arrowleaf groundsel	50	10
SAAR4	Brook saxifrage	50	10
EPGL2	Swamp willow-herb	50	6
PAFI	Rocky Mountain grass of Parnassus	50	1
PEGR	Elephant's head	50	tr
HASA	Slender bog-orchid	50	tr
LITE2	Slender-leaved licoriceroot	25	25
ERPEC	Subalpine daisy	25	25
GECA	Explorer's gentian	25	20
Sedges and Rushes			
CASC5	Holm's sedge	100	51

MANAGEMENT CONSIDERATIONS

The saturated, organic soils of this association make it unsuitable for livestock and large wild ungulate grazing and machinery and off-road vehicle use. Birds and small mammals may find good cover and nesting.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Saturated.

OTHER STUDIES

Kovalchik (1987) described an Eastwood willow-undergreen willow/Holm's sedge association for central Oregon that has the same vegetative composition and structure but different soils.

Willow/Bladder Sedge Plant Association

Salix spp./*Carex utriculata* SW1123
SALIX/CAUT n=12

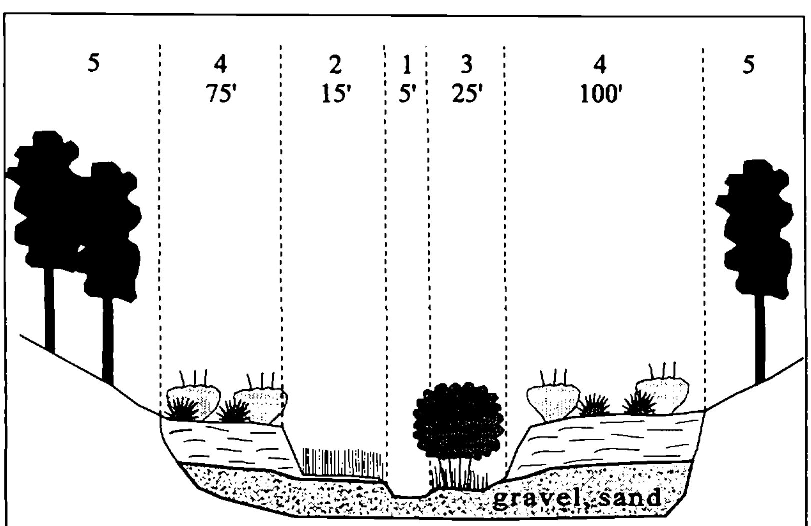
PHYSICAL ENVIRONMENT

The SALIX/CAUT association was sampled on Bear Valley and Burns RDs (Malheur NF), Baker and Unity RDs (Wallowa-Whitman NF), and North Fork John Day RD (Umatilla NF). Valleys with SALIX/CAUT 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. SALIX/CAUT grows on floodplains and in 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. The water table is generally higher than in the SALIX/CAAQ association, 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 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 SALIX/CAUT are low gradient, highly sinuous C5, C6, E4, E5, and E6.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4791	436
Plot Aspect (°)	152	67
Plot Slope (%)	1	1
Valley Width (m)	165	90
Valley Gradient (%)	2	1
Valley Aspect (°)	168	55
Soil Surface Cover (%)		
Submerged	25	32
Bare Ground	8	17
Moss	2	4
Litter	58	38

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, andesite, tuff, mixed sed., unk. metamorphic, Clarno form., mixed alluvium
Water Table Depth (cm)	0-91
Total Rooting Depth (cm)	10-25
Depth to Redoximorphic Features (cm)	10



1 E6 stream reach
2 **Baltic rush (woolly sedge** potential), floodplain
3 **Willow/bladder sedge,** floodplain
4 **Big sagebrush/Cusick's bluegrass,** terraces
5 Ponderosa pine, northwest- and southeast-facing sideslopes

Figure 34. *Trout Creek, Unity RD, Wallowa-Whitman NF; mod. low gradient, mod. elevation, trough-shaped valley; Continental Zone*

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

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. 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. Bladder sedge is the dominant graminoid, sometimes forming a near monoculture. Small amounts of other graminoids and forbs may be present, including large-leaf avens, field mint, western polemonium, common monkey-flower, Douglas' water hemlock, small-fruit bulrush, and Baltic rush. Vegetation types adjacent to sites sampled are: terraces - shrubby cinquefoil/Kentucky bluegrass, ponderosa pine/Kentucky bluegrass, 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, other ponderosa pine associations.

Principal Species		**Con**	**Cov**
Tall Shrubs			
SAGE	Geyer willow	82	22
SABO2	Booth willow	73	21
BEGL	Bog birch	17	65
SABE	Bebb willow	8	30
Perennial Forbs			
GEMA	Large-leaf avens	58	2
MEAR3	Field mint	33	4
POOC	Western polemonium	33	3
Sedges and Rushes			
CAUT	Bladder sedge	100	61
CAAQ	Aquatic sedge	58	18
SCMI	Small-fruit bulrush	42	7
JUBA	Baltic rush	33	20

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 1059 to 3400 (avg. 2069) lbs/acre. Bladder sedge may be grazed by cattle, horses, and elk late in the season when the soils are drier. Its deep rhizomes make it moderately resistant to grazing if trampling does not occur when the soils are wet. Palatability of bladder sedge to cattle, sheep, horses, elk, and mule deer is fair to good (Cope 1992a). If SALIX/CAUT sites are heavily grazed, forbs and graminoids, such as Nebraska sedge and Baltic rush, can become co-dominant with bladder sedge. Downcutting of the stream or loss of beaver dams or other obstructions may change the site potential to SALIX/CAAQ or SALIX/CALA3.

In most years SALIX/CAUT can only be burned in late summer or fall. The deep-seated rhizomes will survive most fires and resprout (Cope 1992a). SALIX/CAUT sites are excellent nesting and feeding areas for many birds and some small mammals.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Seasonally Flooded to Saturated.

OTHER STUDIES

The SALIX/CAUT association has been described by Kovalchik for central Oregon (1987). Padgett and others (1989) and Youngblood and others (1985) describe Booth willow/bladder sedge and Geyer willow/bladder sedge community types for Utah and southeastern Idaho that correspond to the SALIX/CAUT association. Hansen and others (1995) described Geyer willow/bladder sedge and bog birch/bladder sedge habitat types that are similar to the SALIX/CAUT association.

Willow/Aquatic Sedge Plant Association

Salix spp./*Carex aquatilis* SW1114
SALIX/CAAQ n=10

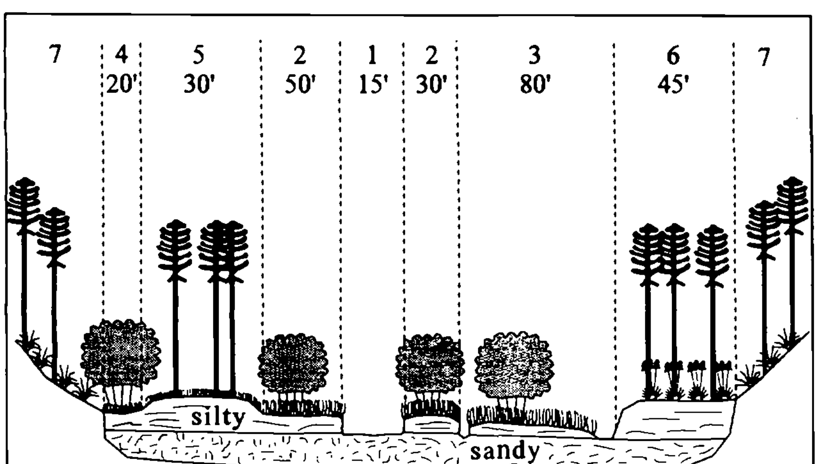
PHYSICAL ENVIRONMENT

The SALIX/CAAQ association was sampled on Bear Valley and Burns RDs (Malheur NF) and Baker and Wallowa Valley RDs (Wallowa-Whitman NF). It occurs or did occur on other districts in the Blue Mountains where the physical setting is appropriate. Valleys with SALIX/CAAQ are moderate to wide (65-1000 ft.), low gradient and flat-shaped with gentle side slopes. Elevations range from 4690 to 5430 ft. SALIX/CAAQ grows on floodplains and occasionally in springs. It thrives on the deep, fine-textured soils that build up behind beaver dams. Soils are Endoaquolls and Endoaquents. The soils consist of fine-textured (silt loam, loam, sandy loam, or organic rich silt) mineral materials. Sites are often flooded in late winter or early spring. The water table can drop during the growing season down to as much as 3 ft. but generally remains within 1-2 ft. of the soil surface. 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 SALIX/CAAQ are low gradient, highly sinuous C4, C5, E4, E5, and E6 and in degraded areas F6.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4935	222
Plot Aspect (°)	267	65
Plot Slope (%)	1	1
Valley Width (m)	111	115
Valley Gradient (%)	1	1
Valley Aspect (°)	268	72
Soil Surface Cover (%)		
Submerged	13	28
Bare Ground	3	3
Gravel	1	2
Moss	6	10
Litter	71	32

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, unk. sedimentary, mixed alluvium
Water Table Depth (cm)	0-71
Total Rooting Depth (cm)	23-76
Depth to Redoximorphic Features (cm)	8-51
Surface Layer	
Thickness (cm)	5-23
Texture(s)	hemic organic, organic loam, silt loam, fine sandy loam
Coarse Fragments (%)	0
Roots very fine: many	fine: many



1 E6 stream reach
2 **Willow/aquatic sedge,** floodplain
3 **Willow/bladder sedge,** floodplain swale
4 **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

Figure 35. *Bear Creek, Bear Valley RD, Malheur NF; very low gradient, mod. elevation, flat-shaped valley; Continental Zone*

medium: none to many	coarse: none
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	33-71
Texture(s)	sapric, hemic organic, silt loam clay loam, loam, fine to medium sandy loam, coarse loamy sand
Coarse Fragments (%)	0-10, gravel
Roots very fine: many	fine: few to many
medium: few to many	coarse: none to few
Redoximorphic Features	common iron oxidation (1-20%)
Substrate	organics, clay loam, sand, gravel

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. Whitestem gooseberry, Drummond's willow, 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. Aquatic sedge is the dominant graminoid, generally excluding extensive cover by forbs. Other graminoids and forbs present include western polemonium, large-leaf avens, Oregon checkermallow, leafy arnica, asters, Baltic rush, small-fruit bulrush, Cusick's sedge, and tufted hairgrass. Vegetation types adjacent to sites sampled are: terraces - big sagebrush/Kentucky bluegrass, lodgepole pine/tufted hairgrass, lodgepole pine/Kentucky bluegrass, silver sagebrush/Cusick's bluegrass, ponderosa pine; sideslopes - ponderosa pine/elk sedge, ponderosa pine/big sagebrush/Idaho fescue-bluebunch wheatgrass, ponderosa pine/pinegrass and ponderosa pine/common snowberry.

Principal Species		**Con**	**Cov**
Tall Shrubs			
SABO2	Booth willow	80	22
SAGE	Geyer willow	50	14
BEGL	Bog birch	20	48
SARI	Rigid willow	20	12
SALA2	Pacific willow	10	40
Perennial Forbs			
POOC	Western polemonium	60	3
ARCH	Leafy arnica	40	5
Sedges and Rushes			
CAAQ	Aquatic sedge	100	64
JUBA	Baltic rush	60	16
CAUT	Bladder sedge	40	7

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 938 to 3223 (avg. 1712) lbs/acre. Aquatic sedge may be grazed by livestock late in the season when the soils are drier. Its deep rhizomes make it moderately resistant to grazing if trampling does not occur when the soils are wet. Wild ungulates will also graze aquatic sedge but it is not a major component of their diet (Cope 1992b). On SALIX/CAAQ sites that are heavily grazed, the aquatic sedge generally decreases and is replaced by forbs, Baltic rush, Nebraska sedge, and ultimately Kentucky bluegrass. The bluegrass will usually only become dominant if the stream has been downcut and the water table lowered. Aquatic sedge reproduces mainly by deep-seated rhizomes and, thus, is well-suited to survive low to moderate intensity fires. Hot fires on a dry substrate can burn up the organic layers and kill the rhizomes. Aquatic sedge can colonize burned areas by seeds and with the spread of its rhizomes (Cope 1992b).

Aquatic sedge provides cover and/or forage for small mammals, water fowl, and other birds including sandhill cranes, green-winged teals, common snipes, common yellowthroat, and red-winged blackbirds.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Seasonally Flooded to Saturated.

OTHER STUDIES

The SALIX/CAAQ association has been described by Kovalchik for central Oregon (1987). Padgett (1981) described a Geyer willow meadow riparian community type for the Silvies River drainage on the Bear Valley and Burns RDs that is similar to SALIX/CAAQ. Padgett and others (1989) describe Booth willow/Aquatic sedge and Geyer willow/aquatic sedge community types for Utah and southeastern Idaho that correspond to the SALIX/CAAQ association.

Willow/Woolly Sedge Plant Association

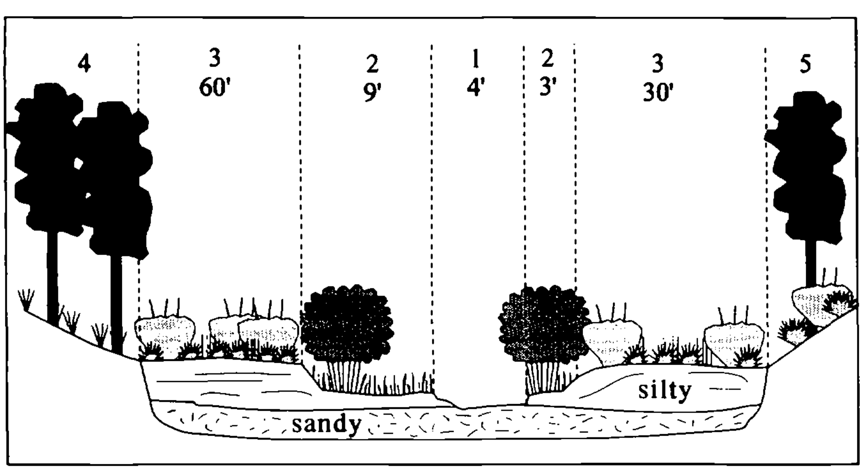
Salix spp./*Carex lanuginosa* SW1112
SALIX/CALA3 n=8

PHYSICAL ENVIRONMENT

The SALIX/CALA3 association was sampled on Burns and Bear Valley RDs (Malheur NF) and Unity RD (Wallowa-Whitman NF). Many SALIX/CALA3 sites have been heavily grazed and are now dominated by Kentucky bluegrass and "increaser" forbs. Valleys with SALIX/CALA3 are generally wide, low gradient, and flat-shaped with gentle to moderately steep side slopes. Elevations range from 4600 to 5770 ft. SALIX/CALA3 is found on floodplains adjacent to E3, E4, E6 and C4 stream reach types. Degraded streams are F4 and F6 types. Soils are Mollisols, Entisols, and one Histosol and are often shallower to buried stream beds than the SALIX/CAAQ and SALIX/CAUT associations. Soil textures are clay loam to fine sandy loam. Sites may be flooded during spring runoff, but the water table drops to 2-3 ft. below the surface by early summer. Stream sizes are 5-30 ft. wide with little debris affecting the active stream channel.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	5043	466
Plot Aspect (°)	108	67
Plot Slope (%)	1	1
Valley Width (m)	157	114
Valley Gradient (%)	2	2
Valley Aspect (°)	100	56
Water Table Depth (cm)	35	32
Depth to Mottling (cm)	17	12
Soil Surface Cover (%)		
Submerged	12	28
Bare Ground	6	12
Gravel	1	1
Rock	1	2
Moss	10	24
Liverwort	3	7
Litter	60	37

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt, tuff, unk. sedimentary
Water Table Depth (cm)	8-91
Total Rooting Depth (cm)	18-51
Depth to Redoximorphic Features (cm)	0-25
Surface Layer	
Thickness (cm)	8-48
Texture(s)	loam, sandy clay loam silt loam, hemic organic
Coarse Fragments (%)	0



1 C5 stream reach
2 **Willow/woolly sedge,** floodplain
3 **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

Figure 36. *Pine Creek, Burns RD, Malheur NF: very low gradient, mod. elevation, flat-shaped valley; Continental Zone*

Roots	very fine: few to many	fine: common to many
	medium: none to common	coarse: none
Redoximorphic Features		some

Subsurface Layer(s)

Thickness (cm)		0-68
Texture(s)		sapric, hemic organic, clay loam, very fine to fine sandy loam, sand
Coarse Fragments (%)		0-20, gravel
Roots	very fine: many	fine: common to many
	medium: few to common	coarse: none
Redoximorphic Features		some iron oxidation

Substrate sandy loam, gravel, cobble, organics

VEGETATION COMPOSITION

Geyer willow, Booth willow, and occasionally Lemmon willow dominate the shrub overstory. Golden currant, baldhip rose, and rigid willow may be scattered through the stand. 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. Other graminoids and forbs that increase in abundance with overgrazing are large-leaf avens, yarrow, northern bedstraw, Northwest cinquefoil, leafy arnica, meadow foxtail, and Baltic rush. 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/elk sedge, lodgepole pine/pinegrass and western juniper/big sagebrush.

Principal Species		**Con**	**Cov**
Tall Shrubs			
SABO2	Booth willow	88	39
SAGE	Geyer willow	50	25
SALE	Lemmon willow	25	11
SARI	Rigid willow	13	25
SABE	Bebb willow	13	70
Perennial Forbs			
GEMA	Large-leaf avens	88	3
ACMI	Yarrow	75	1
POGR	Northwest cinquefoil	63	4
GABO	Northern bedstraw	63	4
SIOR	Oregon checker mallow	50	1
ARCH	Leafy arnica	38	11
Perennial Grasses			
POPR	Kentucky bluegrass	75	38
Sedges and Rushes			
CALA3	Woolly sedge	100	38
JUBA	Baltic rush	75	8
CANE	Nebraska sedge	25	23
ELPA	Creeping spikerush	23	11

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 605 to 2000 (avg. 1255) lbs/acre. Results of grazing disturbance were discussed above. Because this is the driest of the willow/sedge types, it has received the most livestock and wild ungulate use. Rest and mid to late season grazing will allow both willows and woolly sedge to increase in vigor and abundance. During seasons when the soils are wet, livestock should be kept off of SALIX/CALA3 sites (Kovalchik 1987).

As with other rhizomatous sedges, woolly sedge can probably withstand low to moderate-temperature fires. Severe fires will burn surface organic layers and kill woolly sedge rhizomes. Both woolly sedge and Kentucky bluegrass will resprout from rhizomes following burning (Kovalchik 1987).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded to Seasonally Flooded.

OTHER STUDIES

The SALIX/CALA3 association has been described by Kovalchik for central Oregon (1987). Padgett and others (1989) described Booth willow/Mesic graminoid and Geyer willow/Mesic graminoid community types that correspond to SALIX/CALA3.

Willow/Kentucky Bluegrass Plant Community Type

Salix spp./*Poa pratensis* SW1111
SALIX/POPR n=3

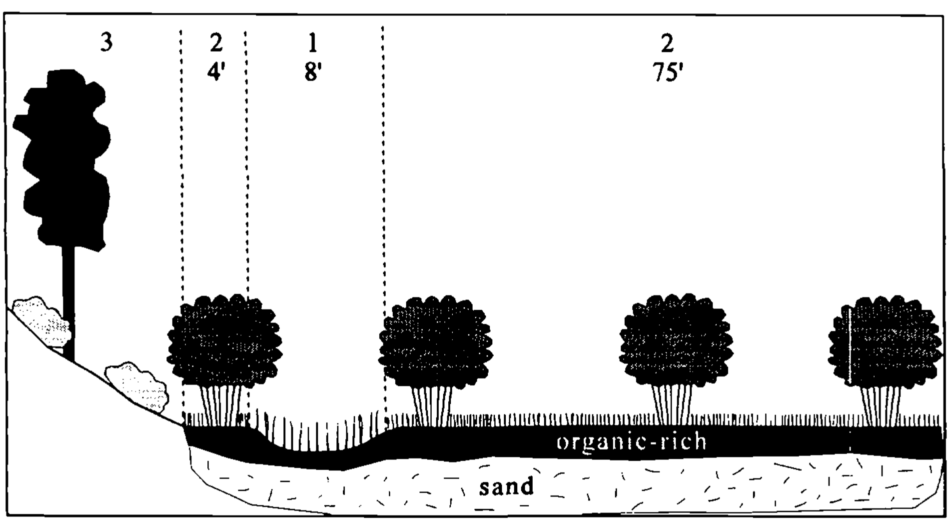
PHYSICAL ENVIRONMENT

The SALIX/POPR community type was sampled on Bear Valley and Burns RDs (Malheur NF) in wide, flat, low gradient valleys with gentle side slopes. Elevations range from 3860 to 5690 ft. SALIX/POPR occurs on floodplains and, occasionally, terraces. Soils are Haploborolls consisting of clay loam to silt loam materials with few coarse fragments. One soil was organic (Fibrist). Sites are infrequently flooded as evidenced by the persistent of Kentucky bluegrass. The water table may rise to within 1 ft. of the soil surface early in the growing season, but drops to 2-5 ft. by late spring or mid-summer. Stream reach types associated with this community type are usually F4, F5, F6 or G6. Streams are 5-15 ft. wide and channels are either little affected by debris or carry the remains of abandoned beaver dams.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4490	554
Plot Aspect (°)	351	72
Plot Slope (%)	1	1
Valley Width (m)	155	78
Valley Gradient (%)	2	1
Valley Aspect (°)	46	66
Water Table Depth (cm)	53	—
Depth to Mottling (cm)	71	—
Soil Surface Cover (%)		
Bare Ground	12	16
Litter	62	43

Soil Profile Characteristics

Bedrock/Parent Material(s)	mixed sedimentary, unk. marine
Water Table Depth (cm)	53
Total Rooting Depth (cm)	71
Depth to Redoximorphic Features (cm)	71
Surface Layer	
Thickness (cm)	15-51
Texture(s)	fibric organic, loam
Coarse Fragments (%)	0
Roots	very fine: few to many; fine: few to many; medium: none to many; coarse: none to few
Redoximorphic Features	some iron oxidation
Subsurface Layer(s)	
Thickness (cm)	50-56
Texture(s)	organic sandy loam, loam, clay loam
Coarse Fragments (%)	0
Roots	very fine: few to many; fine: few to many; medium: few to many; coarse: few to common
Redoximorphic Features	some iron oxidation
Substrate	sand, clay loam



1 **Nebraska sedge**-filled swale
2 **Willow/Kentucky bluegrass (Willow/woolly sedge** potential), floodplain
3 Ponderosa pine/common snowberry, northeast-facing sideslope

Figure 37. *S. Fk. Murderer's Creek, Bear Valley RD, Malheur NF; mod. low gradient, mod. elevation, trough-shaped valley; Mesic Forest Zone 1*

VEGETATION COMPOSITION

SALIX/POPR is a disturbance-induced (usually grazing) seral community. Potential natural vegetation on these sites is usually willow/woolly sedge, but may also be willow/aquatic sedge or willow/bladder sedge. Geyer willow, Booth willow, and/or Lemmon willow dominate the shrub overstory. Idaho gooseberry, bog birch, common snowberry, and Wood's rose may be scattered through the shrub understory. Kentucky bluegrass dominates the herbaceous layer. Small amounts of woolly sedge, aquatic sedge, or bladder sedge may be present, especially under the shrub canopy. Other graminoids and forbs that occur in this community type include common timothy, fowl bluegrass, creeping bentgrass, Baltic rush, yarrow, broadpetal strawberry, Northwest cinquefoil, asters, and large-leaf avens. Vegetation types adjacent to sites sampled are: terraces - big sagebrush/Cusick's bluegrass; sideslopes - ponderosa pine/common snowberry, ponderosa pine/elk sedge, other ponderosa pine associations and big sagebrush/Idaho fescue-bluebunch wheatgrass.

Principal Species		**Con**	**Cov**
Tall Shrubs			
SABO2	Booth willow	100	47
SAGE	Geyer willow	67	10
RIIR	Idaho gooseberry	33	40
SYAL	Common snowberry	33	20
ROWO	Woods rose	33	10
SALA2	Pacific willow	33	10
Perennial forbs			
PEGR	Northwest cinquefoil	67	8
FRVI	Broad-petal strawberry	67	1
ACMI	Yarrow	67	1
POOC	Western polemonium	33	20
SOCA	Meadow goldenrod	33	15
Perennial Grasses			
POPR	Kentucky bluegrass	67	13
PHPR	Common timothy	33	15
AGST	Creeping bentgrass	33	15
Sedges and Rushes			
JUBA	Baltic rush	33	50

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 500 to 1650 (avg. 1167) lbs/acre. Kentucky bluegrass dominance on a site is usually the result of heavy grazing, especially when destabilization of the stream banks and bed occurs and results in lowering of the water table. Other ground disturbances that can favor Kentucky bluegrass domination are heavy machinery use associated with logging, mining or road-building, off-road vehicle use, and repeated or large-scale camping. Kentucky bluegrass does not provide as much stabilization of floodplains and streambanks as the native, rhizomatous sedges that it replaces. Kentucky bluegrass is highly palatable to livestock, elk, pronghorn, mule deer, and white-tailed deer. It is most nutritious in the spring but remains fairly nutritious throughout the summer on moist sites. It is highly resistant to grazing. With severe overgrazing, Kentucky bluegrass can decrease in abundance and be replaced by forbs (Kovalchik 1987). Kentucky bluegrass is moderately resistant to fire. Seed production and rhizome growth may be stimulated by fires. When plants are dormant, cool fires have little effect. There is evidence that late spring burning, when plants have reached full development and major food reserves have been depleted, causes the most injury to plants. Repeated late spring burning can actually rid a site of Kentucky bluegrass. If the site receives ample moisture after the fire, however, burning may have no effect or may increase the bluegrass abundance (Uchytil 1993). Small mammals and birds may find good cover and foraging in Kentucky bluegrass stands. Leaves and seeds are eaten and can be an important food for cottontail rabbits. Open stands of willow/Kentucky bluegrass are good habitat for the northern pocket gopher, the Columbia ground squirrel, and mice species, which in turn makes good foraging grounds for raptors (Uchytil 1993).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

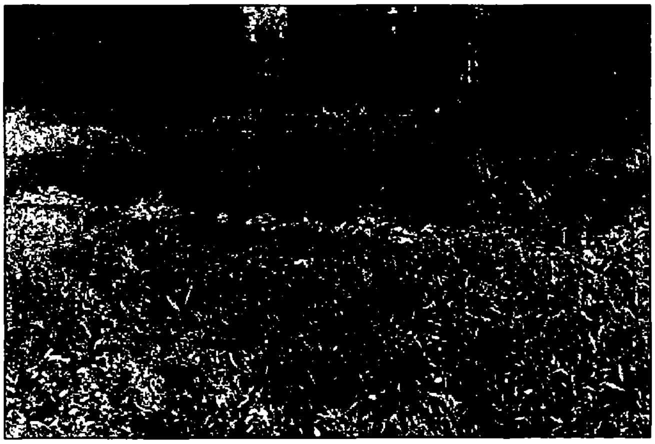
SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded to Intermittently Flooded.

OTHER STUDIES

The SALIX/POPR association has been described by Kovalchik for central Oregon (1987). Padgett and others (1989) described a booth willow/Kentucky bluegrass type for Utah and southeastern Idaho.

Coyote Willow Plant Association

Salix exigua SW1117
SAEX n=9



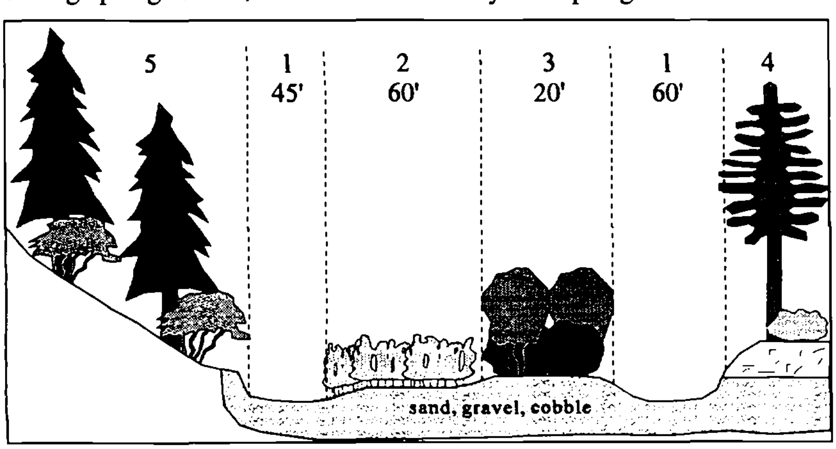
PHYSICAL ENVIRONMENT

The coyote willow association occurs at low to moderate elevations (3000-4340 ft.) throughout the Blue and Wallowa Mountains. Sites were sampled on Long Creek RD (Malheur NF) and Unity, La Grande, Pine, and Hells Canyon NRA RDs (Wallowa-Whitman NFs). SAEX is found on cobbly alluvial bars and banks adjacent to B3, C3, C4 and D3 stream reach types. Valleys are low gradient, narrow to wide (65-650 ft.) U-, trough- and flat-shaped with moderately steep to steep side slopes. Streams are 5-100 ft. wide and have no debris affecting the active stream channel. 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	**Mean**	**S.D.**
Elevation (ft.)	3689	461
Plot Aspect (°)	210	65
Plot Slope (%)	2	1
Valley Width (m)	79	72
Valley Gradient (%)	2	0
Valley Aspect (°)	177	58
Soil Surface Cover (%)		
Submerged	1	1
Bare Ground	16	21
Gravel	5	8
Rock	43	29
Moss	3	7
Litter	32	26

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, andesite, unk. sedimentary, mixed alluvium
Water Table Depth (cm)	10-50
Surface Layer	
Thickness (cm)	0-20
Texture(s)	medium to coarse sand
Coarse Fragments (%)	0-10
Roots very fine: none to many; medium: none to few	fine: few to common; coarse: none to few
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	0
Substrate	gravelly sand, cobble, gravel



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

Figure 38. *Eagle Creek, Pine RD, Wallowa-Whitman NF; mod. gradient, mod. low elevation, flat-shaped valley; Mesic Forest Zone 2*

VEGETATION COMPOSITION

The coyote willow association includes both coyote willow *(Salix exigua* ssp. *exigua)* and dusky willow *(Salix exigua* ssp. *melanopsis)*. Either coyote or dusky willow forms a dense shrub canopy over scattered forbs and graminoids whose total cover probably varies yearly with flooding. The latter include prairie sage, meadow goldenrod, great north aster, curly dock, field mint, common horsetail, creeping bentgrass and bull thistle. Vegetation types adjacent to sites sampled are: terraces - ponderosa pine/common snowberry-floodplain, Douglas-fir/common snowberry-floodplain; sideslopes - ponderosa pine/Idaho fescue-bluebunch wheatgrass, ponderosa pine/pinegrass, ponderosa pine/common snowberry, grand fir/elk sedge, grand fir/pinegrass, grand fir/Rocky Mountain maple, grand fir/blue wildrye (disturbed), grand fir/common snowberry and Douglas fir associations.

Principal Species		Con	Cov
Tall Shrubs			
SAEX	Coyote willow	100	62
SARI	Rigid willow	56	13
ALIN	Mountain alder	56	2
SALA2	Pacific willow	33	22
Perennial Forbs			
ARLU	Prairie sage	56	4
SOCA	Meadow goldenrod	56	1
ACMI	Yarrow	56	1
ASMO	Great north aster	56	4
RUOC	Western coneflower	44	2
RUCR	Curly dock	44	2
MEAR3	Field mint	44	1
GATR	Sweet-scented bedstraw	44	1
Perennial Grasses			
GLEL	Tall mannagrass	56	1
AGST	Creeping bentgrass	44	13
Ferns and Horsetails			
EQAR	Common horsetail	78	12
Annual Forbs			
CIVU	Bull thistle	56	2

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 166 to 969 (avg. 511) lbs/acre. Coyote willow is fairly palatable to sheep, cattle, and mule deer. Coyote willow's rhizomatous growth habit makes it an excellent alluvial bar and streambank stabilizer. The coyote willow association should not be grazed so heavily that livestock rely on the shrubs for forage. Soils are not vulnerable to physical damage due to trampling.

Following fire, coyote willow sprouts from roots and can also revegetate a site through seeding. Lack of abundant ground fuels and high moisture content of the shrubs probably prevents frequent fires from occurring in the coyote willow association (Uchytil 1989e).

Coyote willow is a favorite food of beaver. Deer, small mammals, and birds including waterfowl use coyote willow thickets for hiding and resting cover (Uchytil 1989e).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Seasonally Flooded.

OTHER STUDIES

The SAEX association was described as a miscellaneous type for central Oregon by Kovalchik (1987) and as a major community type for Montana by Hansen and others (1995). Padgett (1981) described the coyote willow riparian dominance type for the Silvies River Basin on the Malheur National Forest. Padgett and others (1989) described a Salix exigua/Barren community type for Utah and southeastern Idaho that includes sites similar to the SAEX association. Manning and Padget (1995) described a Salix exigua cover type for Nevada that includes SAEX association plots. Youngblood and others (1985) name a coyote willow/common horsetail community type that is similar to the SAEX association.

Miscellaneous Willow Types

Undergreen Willow/Bladder Sedge Plant Community

Salix commutata/Carex utriculata
SACO2/CAUT n=1

This community was sampled in the wet meadow (6000 ft. elevation) below Olive Lake on the North Fork John Day RD (Umatilla RD). The valley is broad and flat with a very low gradient. Undergreen willow (SACO2) and Eastwood willow (SAEA) comprise a scattered shrub canopy over a sedge understory of bladder sedge (CAUT) (90%) and aquatic sedge (CAAQ) (10%). The soil is a fine-textured Typic Endoaquent with 10 cm of hemic organic matter on the surface. The water table was 20 cm below the surface and probably remains within 30 cm of the surface throughout the year. This community has not been described elsewhere.

Undergreen Willow/Clustered Field Sedge Plant Community

Salix commutata/Carex praegracilis
SACO2/CAPR5 n=1

One site was sampled in the Hells Canyon NRA (Wallowa-Whitman NF) at 5675 ft. elevation on a seep slope. Undergreen willow (SACO2) forms a fairly dense canopy about 3 ft. tall. Clustered field sedge (CAPR5) dominates the herbaceous understory which includes a scattering of forbs including brook saxifrage (SAAR4), common horsetail (EQAR), arrowleaf groundsel (SETR), leafy arnica (ARCH), and elephant's head (PEGR). The soil is a Typic Borosaprist that was extremely wet but did not have standing water on the surface nor an obvious water table near the surface. This community has not been described elsewhere.

Eastwood Willow-Tweedy's Willow/Aquatic Sedge Plant Community

Salix eastwoodiae-Salix tweedyi/Carex aquatilis
SAEA-SATW/CAAQ n=1

One community was sampled on Bull Run Creek on Baker RD (Wallowa-Whitman NF). The location was a floodplain with a seep running across it. The valley was V-shaped, low gradient, and narrow at 5000 ft. elevation. Eastwood (SAEA) and Tweedy's (SATW) willows and bog birch (BEGL) form a dense canopy over an herbaceous layer dominated by aquatic sedge (CAAQ) with an herbaceous understory of bog St. John's wort (HYAN). The soil is a fine-textured Typic Endoaquent with 15 cm of hemic organic material on the surface. The water table was 10 cm below the surface and remains within 30 cm of the soil surface due to the groundwater flow. Kovalchik (1987) described a miscellaneous Eastwood willow-undergreen willow association for central Oregon that is similar to this community.

Willow/Bluejoint Reedgrass Plant Community

Salix spp*./Calamagrostis canadensis*
SALIX/CACA n=1

This is a miscellaneous community sampled on La Grande RD (Wallowa-Whitman NF). Geyer willow (SAGE) forms a dense canopy over bluejoint reedgrass (CACA) and scattered forbs and graminoids including big-leaf lupine (LUPO), great north aster (ASMO), elephant's head (PEGR), and aquatic sedge (CAAQ). The soil is a Fluvaquent indicating frequent flooding episodes that deposit fresh sediment on the site. This community is described by Youngblood and others (1985) for eastern Idaho and western Wyoming, Padgett and others (1989) for Utah and southeastern Idaho.

Willow/Mesic Forb Plant Community Type

Salix spp*./Mesic Forb*
SALIX/MESIC FORB n=4

Willow/Mesic Forb communities were sampled on Unity RD and Hell's Canyon NRA (Wallowa-Whitman NF) and Walla Walla RD (Umatilla NF). They occur on disturbed areas adjacent to road culverts or in heavily grazed areas and appear to be successional to mountain alder associations. Booth (SABO2) and Geyer (SAGE) willow dominate the shrub overstory with prickly currant (RILA), stinking currant (RIHU), Wood's rose (ROWO), or bearberry honeysuckle (LOIN) making up the shrub understory. Forbs and graminoids include common cowparsnip (HELA), feathery Solomonplume (SMRA), rough bedstraw (GAAS), stinging nettle (URDI), great north aster (ASMO), fowl bluegrass (POPA), tall mannagrass (GLEL), and Dewey's sedge (CADE). Soils are deep, fine-textured Mollisols. Willow/Mesic forb was described by Youngblood and others (1985) for eastern Idaho and western Wyoming, and Padgett and others (1989) for Utah and southeastern Idaho.

Rigid Willow Plant Community Type

Salix rigida
SARI n=3

The rigid willow community type was sampled on three sites on Prairie City RD (Malheur NF) and La Grande and Hells Canyon NRA RDs (Wallowa-Whitman NF). The elevational range was 4070-4990 ft, and valleys were flat, low gradient, and wide with moderately steep side slopes. This community type is similar to the coyote willow association in that it occurs on alluvial bars on C3 and B3 stream reach types. The coarse fragments, however, are primarily gravel- rather than cobble-sized, and the community occurs at higher elevations. Rigid (SARI) and Pacific (SALA2) willows comprise a canopy with 11-60% cover. The herbaceous understory consists of prairie sage (ARLU), leafy arnica (ARCH), yarrow (ACMI), field mint (MEAR3), fowl bluegrass (POPA), common timothy (PHPR), slender hairgrass (DEEL), creeping bentgrass (AGST), and small-winged sedge (CAMI). This is a difficult community type to describe due to the low number of plots, the taxonomic confusion associated with *Salix rigida*, and the low cover of the willows on the sites sampled. Further work may clarify the description and classification of this type. Salix rigida belongs to the Salix lutea (yellow willow) complex. Manning and Padget (1995) and Youngblood and others (1985) described a Salix lutea cover type for Nevada and eastern Idaho-western Wyoming, respectively.

Scouler Willow/Blue Wildrye Plant Community

Salix scouleriana/Elymus glaucus
SASC/ELGL , n=1

One site was sampled on the Touchet River (Pomeroy RD, Umatilla NF) on a floodplain adjacent to a B6 Rosgen stream type at 4000 ft. elevation. The valley is narrow and V-shaped with a high gradient. Scouler willow (SASC) forms a dense canopy over abundant blue wildrye (ELGL) and a scattering of other herbaceous species including musk monkeyflower (MIMO), large-leaf avens (GEMA), sweet-scented bedstraw (GATR), common willow-herb (EPGL2), tufted hairgrass (DECE), and Columbia brome (BRVU). This community is probably seral to a forested plant association.

General Management Considerations for Mountain and Sitka Alder

Mountain alder (*Alnus incana*) is probably the most widepread and abundant riparian shrub on National Forest lands in the Blue Mountain province. It is generally the dominant shrub on the abundant B-type stream reaches in narrow, V-shaped valleys that occur between 3500 and 6500 ft. elevation. It also occurs in other settings such as open, flat-shaped cold air basins; in these valleys, mountain alder-currants/mesic forb may be found along stream banks adjacent to wet sedge meadows (usually aquatic sedge, bladder sedge, Cusick's sedge or bluejoint reedgrass) and lodgepole pine terraces and/or toeslopes. If a stable E-type stream reach has developed in such a valley, the alder may be absent because it requires areas of scour and deposition for successful seedling establishment. In the northern Blue Mountains, i.e. Pomeroy RD, northwestern Walla Walla RD and some areas of North Fork John Day RD that receive maritime climatic influences, and at higher elevations in the Wallowa Mountains, Sitka alder (*Alnus sinuata*) fills this riparian niche. This prevalence of mountain alder rather than willow associations should be considered when developing monitoring, restoration and watershed assessment projects. Although willows are often a desired riparian shrub component and a target species in monitoring programs and projections of desired future conditions (DFCs), they may not be the natural potential dominant shrub in many riparian settings.

Alder species are monoecious, that is both male and female flowers grow on the same plant. Flowers are catkins that are produced during the growing season, overwinter on the plant and expand before or during leaf expansion in the spring. Pollination by wind occurs in May and cones ripen in the fall. Seeds are dispersed in September by wind and water. Germination and seedling establishment are best on moist, mineral substrates. Sitka alder seeds normally germinate in the spring. Mountain alder seeds can germinate immediately after dispersal when conditions are favorable. Seed viability can be very low. Sitka alder starts producing seed at 4 to 7 yrs. of age. While both species are multi-stemmed shrubs, mountain alder attains greater heights (up 30-40 ft. on average in the Blue Mountain Province). Sitka alder is bushier and tends to form 10-15 ft. high thickets. Sitka alder branches are resilient and are seldom damaged by snow creep or avalanches, and its root system is shallow. Alder improves soil fertility through nitrogen-fixing root nodules and nitrogen-rich leaf litter.

Sitka alder has little forage value for livestock or wild ungulates, although plants are occasionally eaten by mule deer. Mountain alder has a poor to fair palatability and nutritional rating for domestic livestock, elk, and deer. Utilization of mountain alder by livestock depends on stand accessibility, stand density, the palatability of other browse species present, and the availability of other forage. Overgrazing and excessive trampling can seriously reduce mountain alder's ability to maintain streambank stability during spring runoff and flooding. With increasing overuse by livestock, the canopy cover of mountain alder becomes discontinuous and will reduce the amount of shade provided to the herbaceous understory and the stream channel. Low alder vigor is indicated by broken stems, diseases, highlining, and lack of younger age classes.

Mountain alder is affected by several fungi and insects in the Blue Mountains. *Cytospora* spp. and *Hypoxylon fuscum* are canker-causing fungi that can kill stems, predispose plants to decay and cause mortality. Infection is most likely to occur in wounded plants. Mottled rot can cause windthrow and mortality. The insects to which alder is most susceptible are fall webworms (*Hyphantria cunea*) and tent caterpillars (*Malacosoma* spp.), which cause defoliation. The blue alder agrilus (*Agrilus burkei*), a woodborer, can attack mountain alder causing dead tops, general plant stress, or mortality. There are also numerous leaf blight (fungi) that can cause spotting of leaves, premature leaf drop, and possible mortality. Removal of infection sources is unlikely to be an effective control strategy for foliage and canker diseases because they are spread mainly by airborne spores over fairly long distances. Root diseases are unlikely to be a hazard to young hardwoods that have been planted or are naturally regenerating on a site where there are leftover dead or infected root systems.

Sitka alder often forms very dense stands, which are excellent thermal and hiding cover for many wildlife species. Young alder twigs and leaves are eaten by deer and elk, muskrats, beaver, cottontails and snowshoe hares. Beavers eat the bark and use the stems for building dams and lodges. Alder seeds, buds, and catkins are eaten by goldfinches, chickadees and siskins and are considered to be an important winter food source. Many bird species also use mountain and Sitka alder for nesting, brood rearing, and foraging.

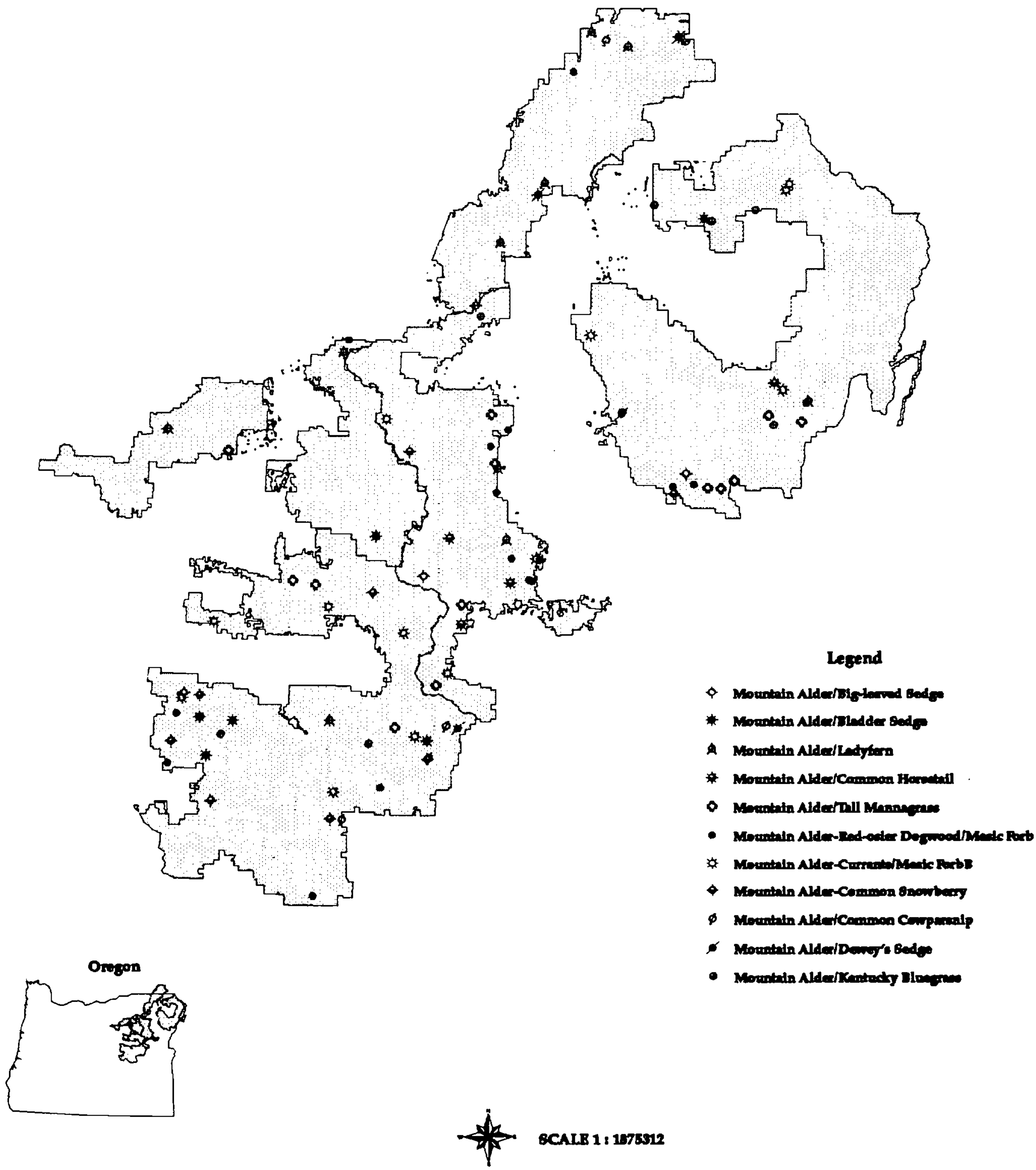
Fire is infrequent in most Sitka and mountain alder types because of the high moisture content and often cool temperatures of sites. Both alder species have the ability to sprout from the root crown following fire. Severe fires can eliminate basal sprouting by completely removing organic soil layers or litter and leaving alder roots exposed and charred. The numerous wind- and water-dispersed seeds produced by alder in the fall can colonize seedbeds produced by late summer fires.

(Information taken from Uchytal 1989f and 1989g, Kovalchik 1987 and Schmitt 1996.)

Figures 39 and 40. Following two pages
Sample sites for mountain alder and Sitka alder types. This map does not represent the actual distribution of mountain and Sitka alder types

Mountain Alder Plant Associations,

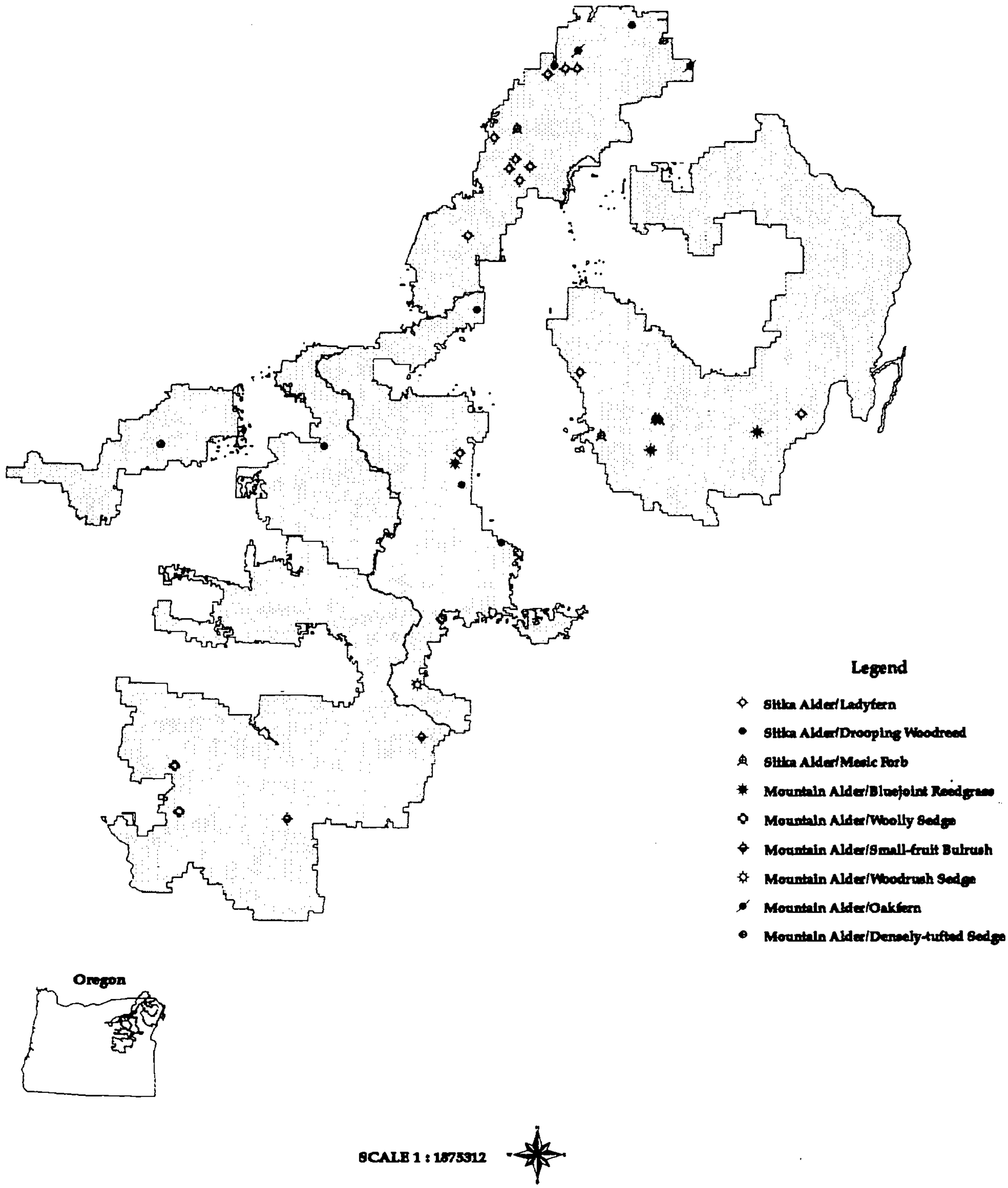
Community Types & Communities



Sitka Alder &,

Misc. Mountain Alder Plant Assoc,

Community Types & Communities



Sitka Alder/Lady Fern Plant Association

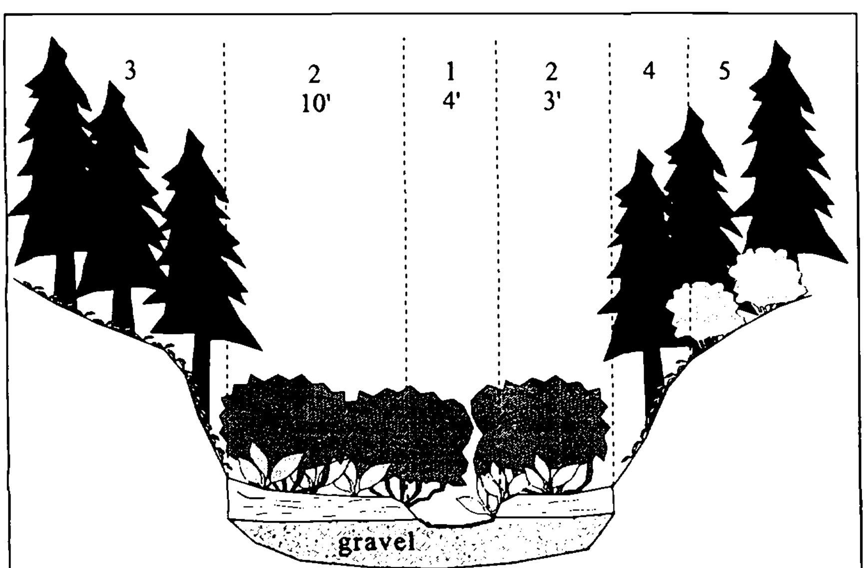
Alnus sinuata/Athyrium filix-femina	SW2111
ALSI/ATFI	n=13

PHYSICAL ENVIRONMENT

The ALSI/ATFI association is similar to the ALIN/ATFI association. It occurs at slightly higher elevations. ALSI/ATFI was 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 ALSI/ATFI 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 ALSI/ATFI are A2, A3, A4, B2, B3, and B4 and occasionally C3 and C4 on lower gradients. Boulder, cobble, and gravel bedloads are predominant. Streams are usually 1-30 ft. 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.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4630	799
Plot Aspect (°)	274	78
Plot Slope (%)	10	18
Valley Width (m)	23	21
Valley Gradient (%)	5	3
Valley Aspect (°)	64	76
Soil Surface Cover (%)		
Submerged	1	3
Bare Ground	4	8
Gravel	1	2
Rock	1	3
Moss	24	23
Liverwort	2	6
Litter	66	27

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



1 A4 stream reach
2 **Sitka alder/ladyfern**, banks and floodplain
3 Grand fir/queen's cup beadlily, south-facing sideslope
4 Grand fir/queen's cup beadlily, north-facing toeslope
5 Grand fir/big huckleberry, north-facing sideslope

Figure 41. *Crazyman Creek, Hell's Canyon NRA, Wallowa-Whitman NF; mod. gradient, mod. high elevation, V-shaped valley; Mesic Forest Zone 2.*

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

VEGETATION COMPOSITION

Sitka alder forms a dense canopy over a rich mixture of mesic forbs and graminoids. Lady fern is generally abundant and is about 2-3 ft. tall. Stinking and prickly currant and thimbleberry are scattered through the shrub layer. 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. Vegetation types adjacent to sites sampled were: terraces - grand fir/oakfern; sideslopes - grand fir/queen's cup beadlily, grand fir/oakfern, grand fir/false bugbane, 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.

Principal Species		**Con**	**Cov**
Tall Shrubs			
ALSI	Sitka alder	100	76
RILA	Prickly currant	77	9
RUPA	Thimbleberry	62	5
RIHU	Stinking currant	38	6
Perennial Forbs			
GATR	Sweet-scented bedstraw	92	1
STAM	Clasp-leaf twistedstalk	85	7
CIAL	Enchanter's nightshade	85	6
MOCO	Heart-leaved miner's lettuce	85	2
MIPE	Alpine mitrewort	77	30
URDI	Stinging nettle	77	2
ACCO	Monkshood	77	1
Perennial Grasses			
CILA2	Drooping woodreed	92	5
Ferns and Horsetails			
ATFI	Lady fern	100	41

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 183 to 1833 (avg. 860) lbs/acre. Lady fern contains filicic acid and may be poisonous to some classes of livestock (Walkup 1991a). It does not appear to be highly palatable to domestic livestock. Wild ungulates occasionally feed on the fronds.

Fire is infrequent in this cool, wet association. Lady fern resprouts from surviving rhizomes following fire. It may not survive moderately severe fires during dry years (Walkup 1991a).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded.

OTHER STUDIES

The ALSI/ATFI association was described in eastern Washington (Kovalchik 1992). Diaz and Mellon (1996) include ALSI/ATFI plots in their ALSI plant association.

Sitka Alder/Drooping Woodreed Plant Association

Alnus sinuata/Cinna latifolia	SW2112
ALSI/CILA2	n=6

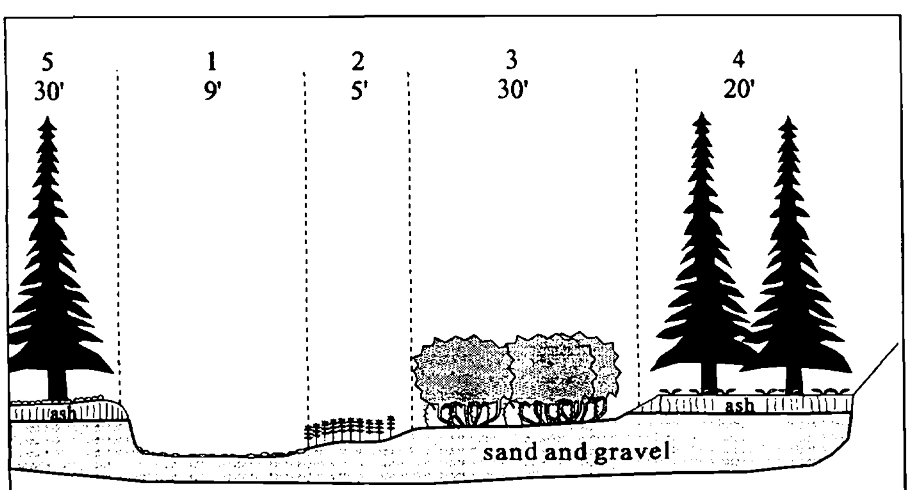
PHYSICAL ENVIRONMENT

The ALSI/CILA2 association occurs in the northern half of the Blue Mountains (Walla Walla, Pomeroy, and North Fork John Day RDs, Umatilla NF; Baker RD, Wallowa-Whitman NF). Valley types in which ALSI/CILA2 is found are generally narrow and V-shaped with moderately steep to very steep side slopes. Valley gradients are moderately to very steep (2-10%). Fluvial surfaces on which this type occurs are floodplains, streambanks, and gravel bars. Stream reach types associated with ALSI/CILA2 are A2, A3 and B3. Boulder and cobble bedloads are predominant. Streams are 1-15 ft. wide with debris affecting 0- >50% of the active channel. ALSI/CILA2 has much shallower depths to the buried streambed than ALSI/ATFI. 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.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4712	1130
Plot Aspect (°)	360	37
Plot Slope (%)	10	9
Valley Width (m)	48	75
Valley Gradient (%)	6	3
Valley Aspect (°)	354	31
Soil Surface Cover (%)		
Submerged	3	6
Bare Ground	1	1
Gravel	2	4
Rock	3	3
Moss	21	21
Litter	60	28

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: few
Redoximorphic Features	none



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

Figure 42. *N. Fk. Cable Creek, North Fork John Day RD, Umatilla NF; mod. low gradient, mod. elevation, V-shaped valley; Mesic Forest Zone 1*

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

VEGETATION COMPOSITION

Sitka alder forms a dense canopy over a rich mixture of graminoids and wet forbs. Drooping woodreed is generally abundant and is about 3 ft. tall. Stinking and prickly currant and thimbleberry are scattered through the shrub layer. Wet forbs include brook saxifrage, coolwort foamflower, enchanter's nightshade, and large-leaf avens. Tall mannagrass is also frequently found in the herbaceous layer. The relationship among the ALSI/CILA2, RIBES/CILA2, and CILA2 associations is not clear; some RIBES/CILA2 communities may be seral to ALSI/CILA2. Vegetation types adjacent to sites sampled are: terraces - subalpine fir/twinflower; sideslopes - subalpine fir-Engelmann spruce and grand fir associations.

Principal Species		**Con**	**Cov**
Tall Shrubs			
ALSI	Sitka alder	100	38
RIHU	Stinking currant	67	17
RILA	Prickly currant	67	7
RUPA	Thimbleberry	67	2
Perennial Forbs			
SAAR4	Brook saxifrage	83	6
GATR	Sweet-scented bedstraw	83	1
TITRU	Coolwort foamflower	67	6
CIAL	Enchanter's nightshade	67	4
GEMA	Large-leaf avens	67	2
STAM	Clasp-leaf twistedstalk	67	2
ANAR2	Sharptooth angelica	67	2
MIPE	Alpine mitrewort	67	2
SETR	Arrowleaf groundsel	67	2
Perennial Grasses			
CILA2	Drooping woodreed	100	20
GLEL	Tall mannagrass	67	12
Ferns and Horsetails			
ATFI	Lady fern	67	2

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 150 to 2100 (avg. 1280) lbs/acre. Dropping woodreed does not appear to be highly palatable to wild ungulates or domestic livestock.

Fire is infrequent in this cool, wet association. Drooping woodreed is rhizomatous and would likely resprout if above-ground plant parts were killed by fire. The rhizomes are generally in moist to saturated soils and would be protected except when very hot fires occur during droughty years.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

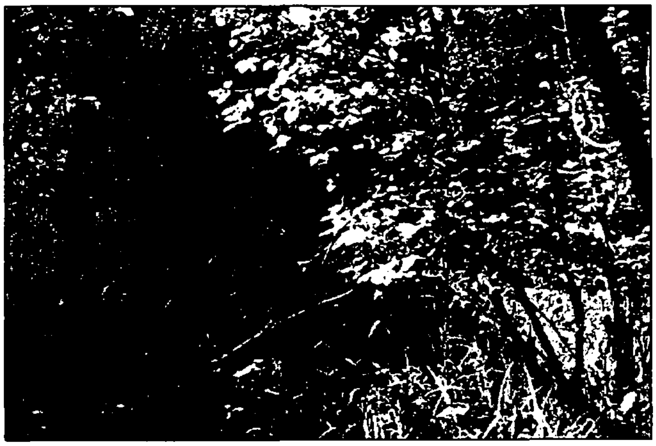
SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded.

OTHER STUDIES

The ALSI/CILA2 association has not been previously described.

Mountain Alder/Big-leaved Sedge Plant Association

Alnus incana/Carex amplifolia SW2114
ALIN/CAAM n=7



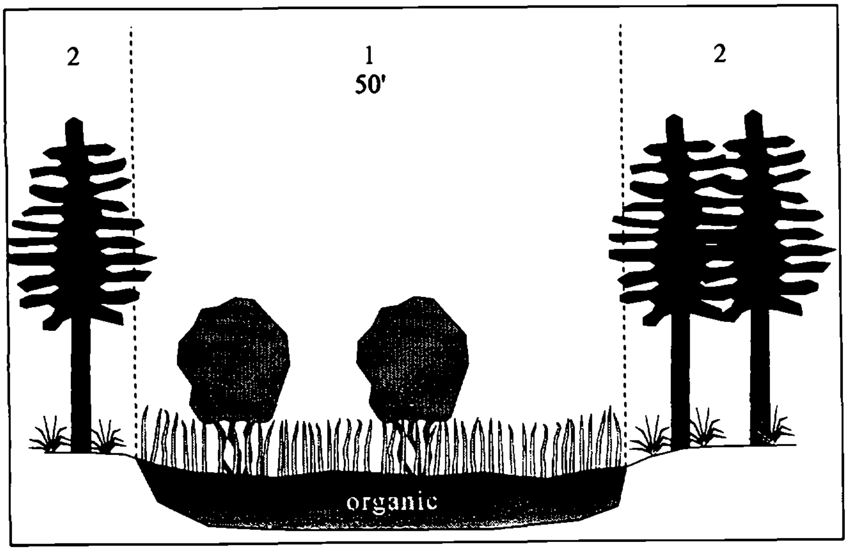
PHYSICAL ENVIRONMENT

The ALIN/CAAM association is found at moderate elevations throughout the Blue and Wallowa Mountains. Valleys with the ALIN/CAAM type are narrow and generally V- or trough-shaped. Valley gradients are generally 1-2%, but one plot was 7%. ALIN/CAAM occurs in springs. Some occurrences are 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 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 ALIN/CAAM occurs that encourages the growth of big-leaved sedge. There are other mountain alder communities that occur on springs in the Blue Mountains that are not dominated by big-leaved sedge.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4611	730
Plot Aspect (°)	174	62
Plot Slope (%)	7	10
Valley Width (m)	35	28
Valley Gradient (%)	3	2
Valley Aspect (°)	211	69
Soil Surface Cover (%)		
Submerged	18	22
Bare Ground	6	7
Moss	26	32
Liverwort	1	2
Litter	47	40

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, andesite, Clarno form., unknown marine
Water Table Depth (cm)	0-58
Total Rooting Depth (cm)	15-45
Depth to Redoximorphic Features (cm)	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	none



1 **Mountain alder/big-leaved sedge, spring**

2 Douglas fir/pinegrass, surrounding terrace

Figure 43. *Crane Creek, Prairie City RD, Malheur NF; very low gradient, mod. elevation, trough-shaped spring on terrace of Crane Creek; Continental Zone*

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 forms a dense canopy over a tall (3 ft.), thick graminoid layer of big-leaved sedge and tall mannagrass. Wet forbs, including common monkey-flower, musk monkey-flower, sweet-scented bedstraw, and common willow-herb, comprise a scattered herbaceous understory. Adjacent upland plant associations are: grand fir/queen's cup beadlily, grand fir/grouse huckleberry, grand fir/big huckleberry, grand fir/pinegrass, and other grand fir associations.

Principal Species		**Con**	**Cov**
Tall Shrubs			
ALIN	Mountain alder	100	60
RIHU	Stinking currant	43	14
RUPA	Thimbleberry	80	4
RILA	Prickly currant	80	3
Perennial Forbs			
MIGU	Common monkey-flower	71	2
GATR	Sweet-scented bedstraw	57	2
MIMO	Musk monkey-flower	57	1
EPGL2	Common willow herb	57	1
ASMO	Great north aster	43	5
Perennial Grasses			
GLEL	Tall mannagrass	100	31
Sedges and Rushes			
CAAM	Big-leaved sedge	100	53
SCMI	Panicled bulrush	53	3

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 1000 to 3248 (avg. 1718) lbs/acre. This association usually does not occupy a large area (approx. 50-300 sq. meters) and, therefore, would not provide much forage for livestock. The soils are generally too soft and mucky to support large animals. These springs are probably good water sources for many wildlife species as well as hiding and nesting cover for songbirds and small mammals. ALIN/CAAM probably has a very long fire return interval due to high moisture.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

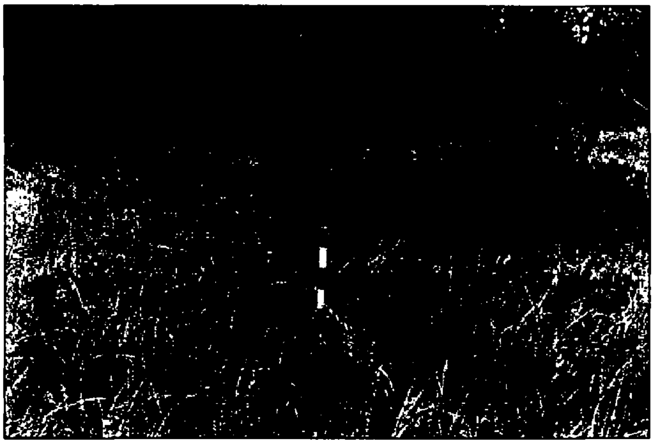
SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Semi-permanently Flooded.

OTHER STUDIES

The ALIN/CAAM association has not been described elsewhere. Kovalchik (1987) described the Mountain Alder Springs Association in central Oregon which included ALIN/CAAM communities.

Mountain Alder/Bladder Sedge Plant Association

Alnus incana/Carex utriculata SW2115
ALIN/CAUT n=6



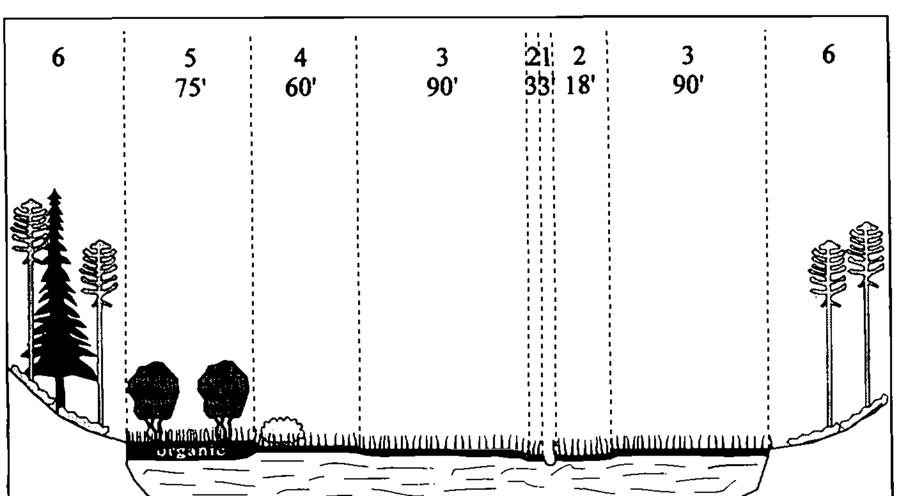
PHYSICAL ENVIRONMENT

The ALIN/CAUT 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 SALIX/CAUT association that is abundant in the Great Basin and similar continental climatic zones. Valleys with ALIN/CAUT are generally wide and flat or trough-shaped. Valley gradients are generally 1-2%. ALIN/CAUT occurs on floodplains or in wet basins where flat topography, poor drainage, beaver dams, road crossings, and other obstructions flood alder sites. Adjacent stream reach types are C4, C5, E5 and E6. Soils are Saprists, Hemists, 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	**Mean**	**S.D.**
Elevation (ft.)	4955	577
Plot Aspect (°)	23	68
Plot Slope (%)	1	1
Valley Width (m)	125	84
Valley Gradient (%)	2	1
Valley Aspect (°)	52	74
Soil Surface Cover (%)		
Submerged	6	12
Bare Ground	19	20
Moss	6	12
Liverwort	10	24
Litter	47	34

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, glacial moraines, mixed sedimentary
Water Table Depth (cm)	8-74
Total Rooting Depth (cm)	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



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

Figure 44. *Lake Creek, North Fork John Day RD, Umatilla NF; very low gradient, mod. high elevation, flat-shaped valley; Mesic Forest Zone 1*

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. Bladder sedge is the dominant graminoid or has at least 25% cover. Forb species richness is low due to wet sites and the dense cover of alder and sedges. Vegetation types adjacent to sites sampled are: terraces - shrubby cinquefoil/Kentucky bluegrass, ponderosa pine/ Kentucky bluegrass; sideslopes - ponderosa pine/ bitterbrush/elk sedge, ponderosa pine/elk sedge, Douglas fir/elk sedge, grand fir/pinegrass and subalpine fir/ grouse huckleberry.

Principal Species		**Con**	**Cov**
Shrubs			
ALIN	Mountain alder	100	32
Perennial Forbs			
VEAM	American speedwell	67	6
GEMA	Large-leaf avens	50	3
EPGL2	Common willow herb	50	3
POOC	Western polemonium	50	2
MEAR3	Field mint	50	2
Sedges and Rushes			
CAUT	Bladder sedge	100	46
CACU2	Cusick's sedge	50	14
SCMI	Small-fruit bulrush	50	3
CAAQ	Aquatic sedge	33	37
CALA3	Woolly sedge	33	28

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 1533 to 2967 (avg. 2344) lbs/acre. Bladder sedge has fair to good palatability for cattle, horses, deer, and elk and can withstand moderate grazing.

Fire is infrequent in this wet association, and it can be difficult to burn (Cope 1992a). Fire can consume the above-ground parts of bladder sedge, but the rhizomes survive most fires, even those that consume organic soils. Fire causes little herbaceous species composition change in ALIN/CAUT (Cope 1992a).

Bladder sedge provides valuable breeding and feeding grounds for waterfowl. Common yellowthroats, red-winged blackbirds, song sparrows, and tree swallows are commonly associated with bladder sedge. On streambanks bladder sedge forms a dense sod that provides good shade and cover for fish, especially when banks are undercut (Cope 1992a).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

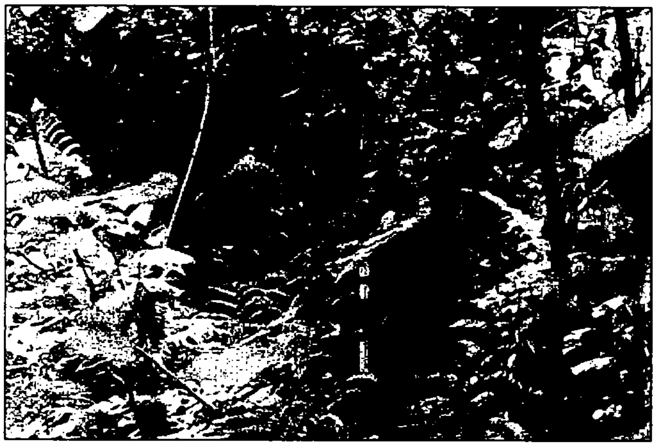
SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Seasonally Flooded to Saturated.

OTHER STUDIES

The ALIN/CAUT association was described for eastern Washington by Kovalchik (1992).

Mountain Alder/Lady Fern Plant Association

Alnus incana/Athyrium filix-femina SW2116
ALIN/ATFI n=10



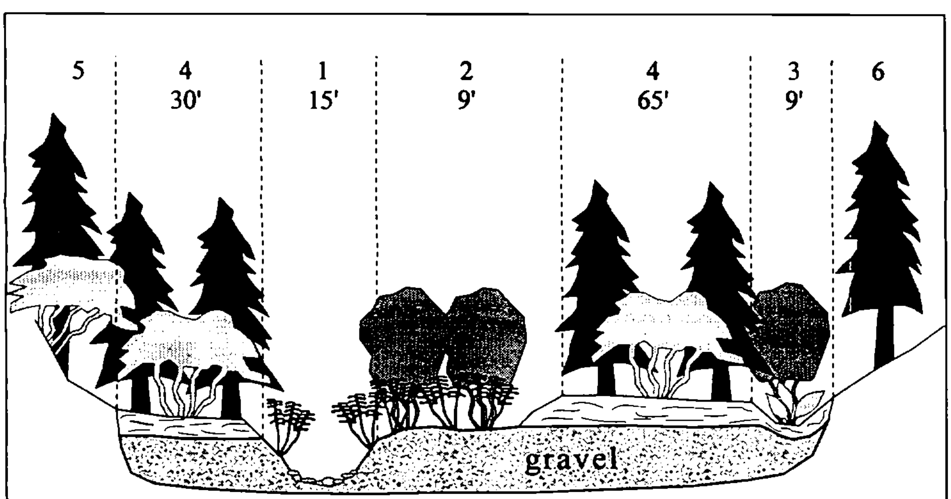
PHYSICAL ENVIRONMENT

The ALIN/ATFI association is similar to the ALSI/ATFI association but is found at lower elevations. It also extends farther south in the Blue Mountains. Plots were sampled on Walla Walla, North Fork John Day, and Pomeroy RDs (Umatilla NF), Baker RD and Hells Canyon NRA (Wallowa-Whitman NF), and Bear Valley RD (Malheur NF). Valleys with the ALIN/ATFI type are narrow and generally V-shaped but can also be wide and flat. Valley gradients are generally below 3% but can range up to 10% in V-shaped valleys. Fluvial surfaces on which this type occurs are floodplains, streambanks, springs, and wet valley bottoms. Stream reach types commonly associated with ALIN/ATFI are B3, B4, B5 and A3 and, in two lower gradient valleys, C3 and E6. Cobble and gravel bedloads are predominant. Streams are usually 1-15 ft. 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.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4177	762
Plot Aspect (°)	2	80
Plot Slope (%)	4	3
Valley Width (m)	26	21
Valley Gradient (%)	4	3
Valley Aspect (°)	37	78
Soil Surface Cover (%)		
Submerged	4	6
Bare Ground	2	3
Gravel	1	1
Moss	53	36
Liverwort	1	2
Litter	39	35

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, andesite, diorite mixed sedimentary, mixed alluvium
Water Table Depth (cm)	15-56
Total Rooting Depth (cm)	5-33
Depth to Redoximorphic Features (cm)	13-46
Surface Layer	
Thickness (cm)	0-33
Texture(s)	organic loam, silt loam, loam fine to medium sandy loam



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

Figure 45. *Pearson Creek, North Fork John Day RD, Umatilla NF; mod. low gradient, mod. low elevation, flat-shaped valley; Mesic Forest Zone 2.*

Coarse Fragments (%)	0
Roots very fine: many, medium: none to few	fine: common to many, 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: few to many, medium: none to few	fine: few to many, coarse: none to few
Redoximorphic Features	20-50% iron concentrations, some gleying

Substrate sand, gravel, cobble

VEGETATION COMPOSITION

Mountain alder forms a dense canopy over a rich mixture of mesic forbs. Lady fern is generally abundant and is about 2-3 ft. tall. Stinking and prickly currant and thimbleberry are scattered through the shrub layer. Drooping woodreed is the dominant graminoid. Vegetation types adjacent to sites sampled are: terraces - grand fir/Rocky Mountain maple-floodplain, grand fir/ladyfern; 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.

Principal Species		**Con**	**Cov**
Tall Shrubs			
ALIN	Mountain alder	100	53
RIHU	Stinking currant	80	17
RILA	Prickly currant	70	10
SYAL	Common snowberry	60	3
RUPA	Thimbleberry	60	3
COST	Red-osier dogwood	50	10
Perennial Forbs			
GATR	Sweet-scented bedstraw	100	2
CIAL	Enchanter's nightshade	70	6
GEMA	Large-leaf avens	80	4
MIPE	Alpine mitrewort	70	1
MOCO	Heart-leaved miner's lettuce	70	6
EPGL2	Common willow weed	70	1
MIPE	Trailplant	70	1
SETR	Arrow-leaf groundsel	60	3
URDI	Stinging nettle	60	3
SAAR4	Brook saxifrage	60	2
VEAM	American speedwell	60	2
SMST	Starry false-Solomon's seal	60	1
ACCO	Columbia monkshood	60	1
Perennial Grasses			
CILA2	Drooping woodreed	90	20
GLEL	Tall mannagrass	70	3
Ferns and Horsetails			
ATFI	Lady fern	100	31
Sedges and Rushes			
CADE	Dewey's sedge	60	4

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 333 to 1967 (avg. 1260) lbs/acre. Lady fern contains filicic acid and may be poisonous to some classes of livestock (Walkup 1991a). It does not appear to be highly palatable to domestic livestock. Wild ungulates occasionally feed on the fronds.

Fire is infrequent in this cool, wet association. Lady fern resprouts from surviving rhizomes following fire. It may not survive moderately severe fires during dry years (Walkup 1991a).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded.

OTHER STUDIES

The ALIN/ATFI association was described in eastern Washington (Kovalchik 1992). It has not been described elsewhere.

Mountain Alder/Tall Mannagrass Plant Association

Alnus incana/Glyceria elata	SW2215
ALIN/GLEL	n=13

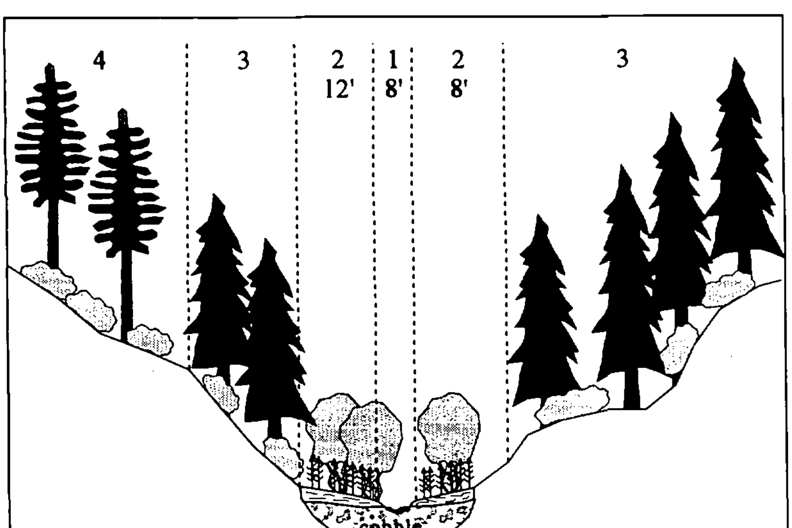
PHYSICAL ENVIRONMENT

The ALIN/GLEL association is found at moderate elevations throughout the Blue and Wallowa Mountains. Valleys with the ALIN/GLEL type range from very narrow to very wide and are V- or trough-shaped. Valley gradients are generally 2% but can be as much as 7-8%. ALIN/GLEL occurs on floodplains, streambanks, and in springs. Sites are generally depositional areas that accumulate fine-textured sediments during high streamflow or as input from constant spring flow. 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 remain wet throughout the growing season. The soil within the rooting zone remains moist throughout the growing season. Estimated water holding capacity is moderate to high.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4627	688
Plot Aspect (°)	113	60
Plot Slope (%)	8	12
Valley Width (m)	80	106
Valley Gradient (%)	4	3
Valley Aspect (°)	98	56
Soil Surface Cover (%)		
Submerged	8	11
Bare Ground	13	19
Gravel	1	2
Rock	2	3
Moss	23	27
Liverwort	5	19
Litter	48	34

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, andesite, glacial moraines, mixed alluvium
Water Table Depth (cm)	20-76
Total Rooting Depth (cm)	15-30
Depth to Redoximorphic Features (cm)	0-8
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



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

Figure 46. *Snow Fork, Pine RD, Wallowa-Whitman NF; high gradient, mod. low elevation, V-shaped valley; Mesic Forest Zone 2*

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 over tall mannagrass and a mixture of wet forbs. Tall mannagrass cover ranges from 5% to greater than 50%. Stinking currant and/or prickly currant are often scattered throughout the site. The forb layer includes large-leaf avens, sweet-scented bedstraw, American speedwell, enchanter's nightshade, musk monkeyflower, and monkshood. 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.

Principal Species		**Con**	**Cov**
Tall Shrubs			
ALIN	Mountain alder	100	63
RIHU	Stinking currant	85	19
Perennial Forbs			
GEMA	Large-leaf avens	100	2
GATR	Sweet-scented bedstraw	69	4
VEAM	American speedwell	62	4
CIAL	Enchanter's nightshade	54	5
Perennial Grasses			
GLEL	Tall mannagrass	100	30
Ferns and Horsetails			
EQAR	Common horsetail	46	15

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 1000 to 3248 (avg. 1718) lbs/acre. Fire is infrequent in this wet association. Tall mannagrass is rhizomatous and would likely resprout if above-ground plant parts were killed by fire. The rhizomes are generally in moist to saturated soils and would be protected except from very hot fires during droughty years.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded to Saturated.

OTHER STUDIES

The ALIN/GLEL association has been described for eastern Washington by Kovalchik (1992). This type is also similar to the Mountain Alder Springs Association described by Kovalchik (1987) in central Oregon, which included ALIN/GLEL communities.

Mountain Alder-Red-osier Dogwood/Mesic Forb Plant Association

Alnus incana-Cornus stolonifera/Mesic Forb SW2216
ALIN-COST/MESIC FORB n=17

PHYSICAL ENVIRONMENT

The ALIN-COST/MESIC FORB association is found at moderate elevations throughout the Blue and Wallowa Mountains. Valleys in which the ALIN-COST/MESIC FORB type occurs are generally narrow and V-shaped with moderate to high gradients (2-10%) but can occasionally be broader and flat-shaped. ALIN-COST/MESIC FORB is found on floodplains, streambanks, or alluvial bars. Soils are Endoaquents, Psammaquents, Endoaquolls, Udifluvents and one Borosaprist. The soils can consist of skeletal or fine-textured material. The fluvial surface is probably flooded most years in late winter or early spring. The water table drops through the growing season down to as much as 3 ft. Red-osier dogwood needs fresh, aerated water to establish and probably seasonally aerated (non-saturated) soils to thrive. Stream reach types adjacent to this association were usually fast-flowing B2, B3, B4, streams.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4217	579
Plot Aspect (°)	131	58
Plot Slope (%)	5	8
Valley Width (m)	63	69
Valley Gradient (%)	4	2
Valley Aspect (°)	123	60
Soil Surface Cover (%)		
Submerged	2	7
Bare Ground	5	9
Gravel	7	14
Rock	8	10
Moss	7	12
Litter	69	26

Soil Profile Characteristics

Bedrock/Parent Material(s) basalt, tuff, granite, moraines, mixed metamorphic, mixed sedimentary, mixed alluvium

Water Table Depth (cm)	10-100
Total Rooting Depth (cm)	12-48
Depth to Redoximorphic Features (cm)	0-56

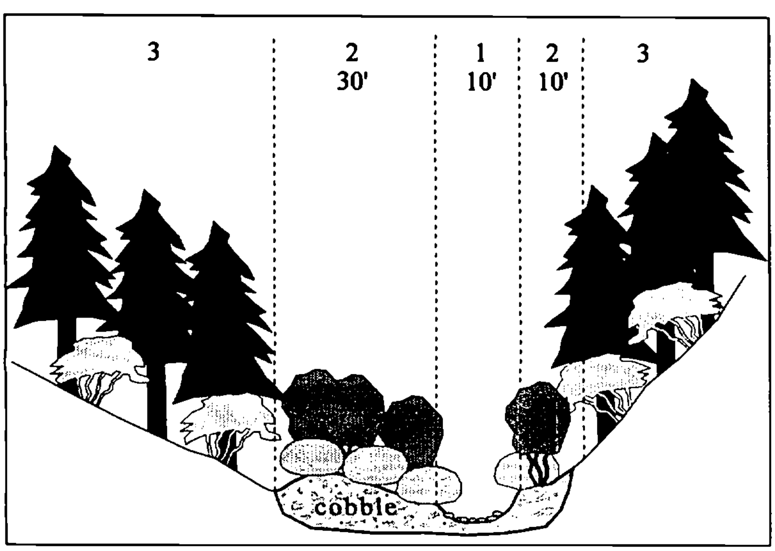
Surface Layer

Thickness (cm) 3-52

Texture(s) loam, very fine to fine sandy loam, silt loam, organic loam, sapric organic

Coarse Fragments (%) 0-80, gravel to boulders

Roots very fine: none to many fine: few to many medium: few to common coarse: few to many



1 B3 stream reach
2 **Mountain alder-red-osier dogwood/mesic forb,** floodplain
3 Grand fir/Rocky Mtn. maple, east- and west-facing, sideslopes

Figure 47. *Touchet River, Pomeroy RD, Umatilla NF; mod.. gradient, mod. low elevation, V-shaped valley; Mesic Forest Zone 2*

Redoximorphic Features	some iron concentrations
Subsurface Layer(s)	
Thickness (cm)	18-76
Texture(s)	very fine to medium sandy loam, silt loam, loam, loamy sand, sand
Coarse Fragments (%)	0-50, gravel, cobble
Roots very fine: none to many	fine: few to many
medium: none to common	coarse: few to common
Redoximorphic Features	some iron concentrations
Substrate	sand, gravel, cobble, boulders

VEGETATION COMPOSITION

Mountain alder is the shrub overstory (avg. 20 ft. tall) with a shrub understory of red-osier dogwood (avg. 8 ft. tall). Prickly currant, stinking currant, red raspberry, and common snowberry are scattered through the shrub understory. The herbaceous layer includes large-leaf avens, sweet-scented bedstraw, stinging nettle, sharptooth angelica, clasp-leaf twistedstalk, tall mannagrass, drooping woodreed, and Dewey's sedge. Vegetation types adjacent to sites sampled are: 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.

Principal Species		**Con**	**Cov**
Tall Shrubs			
ALIN	Mountain alder	100	60
COST	Red-osier dogwood	100	44
RILA	Prickly currant	76	15
SYAL	Common snowberry	59	16
RIHU	Stinking currant	59	6
Perennial Forbs			
GATR	Sweet-scented bedstraw	82	3
GEMA	Large-leaf avens	71	2
URDI	Stinging nettle	65	3
ANAR2	Sharptooth angelica	53	2
CIAL	Enchanter's nightshade	47	12
Perennial Grasses			
GLEL	Tall mannagrass	71	3

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 133 to 867 (avg. 452) lbs/acre. The herbaceous layer in this association is much sparser and less resilient than in mountain alder associations with rhizomatous species dominating the herbaceous understory. Heavy grazing of ALIN-COST/MESIC FORB reduces the diversity and cover of herbaceous species and mosses and compacts the soil. This may be detrimental to amphibian, small mammal and insect habitat along the stream. Mule deer are heavy browsers of leaves and sprouts of red-osier dogwood in the summer and light browsers in the fall and winter. Elk browse red-osier dogwood in the winter. Sprouts are palatable to livestock but not a preferred forage. Red-osier dogwood can sprout from surviving roots, stolons, and the bases of aerial stems following fire. It is a seed-banking species, and light fires that partially remove the duff layer can stimulate germination of buried seeds. The roots will survive all but the most severe fires and fires that cause extended heating of the upper part of the soil profile. Red-osier dogwood generally increases in abundance following burning (Crane 1989). Red-osier dogwood provides food and cover for mule deer, elk, mountain goats, cottontail rabbits, snowshoe hares, and many birds, including bobwhite, ring-necked pheasants, wild turkeys, and grouse. The fruits are an important black bear food and are also eaten by songbirds, grouse, quail, partridge, cutthroat trout, ducks, crows, mice, and other mammals. The young stems and bark are eaten by deer mice, meadow voles, and other small rodents. Red-osier dogwood often grows in dense thickets because of its layering ability. These thickets provide good mule deer fawning and rearing areas and nesting habitat for many songbirds (Crane 1989).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

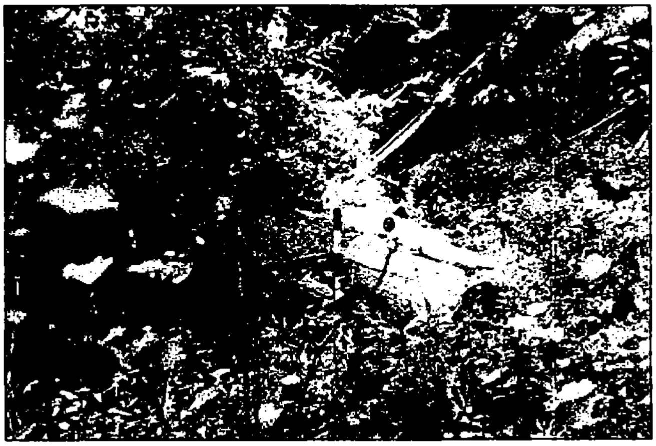
SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded.

OTHER STUDIES

The ALIN-COST/MESIC FORB association has not been described elsewhere. Kovalchik described the Mountain Alder Association in central Oregon (1987) and the Mountain Alder/Mesic Forb Association in eastern Washington (1992) both of which contain ALIN-COST/MESIC FORB communities. Manning and Padget (1995) describe an Alnus incana/Cornus sericea plant community type for Nevada. Padgett and others (1989) describe the Alnus incana/Cornus sericea community type for Utah and southeastern Idaho.

Mountain Alder-Currants/Mesic Forb Plant Association

Alnus incana-Ribes spp./Mesic Forb SW2217
ALIN-RIBES/MESIC FORB n=14



PHYSICAL ENVIRONMENT

The ALIN-RIBES/MESIC FORB association is found at moderate to high elevations (3800-5780 ft.) throughout the Blue and Wallowa Mountains. It occurs at higher elevations and tends to have wetter and shallower, coarser-textured soils than ALIN-COST/MESIC FORB. Valleys in which the ALIN-RIBES/MESIC FORB type occurs are generally narrow and V-shaped with moderate to high gradients (2-7%). ALIN-RIBES/MESIC FORB is found on floodplains and streambanks in Entisols (Endoaquents, Udifluvents, and Udorthents). The soils are 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. Stream reach types adjacent to sample sites are fast-flowing A3, A4, B3, B4, and occasional C4's. Streams are generally 5-15 ft. wide with large woody debris affecting 30-50% of the stream channel.

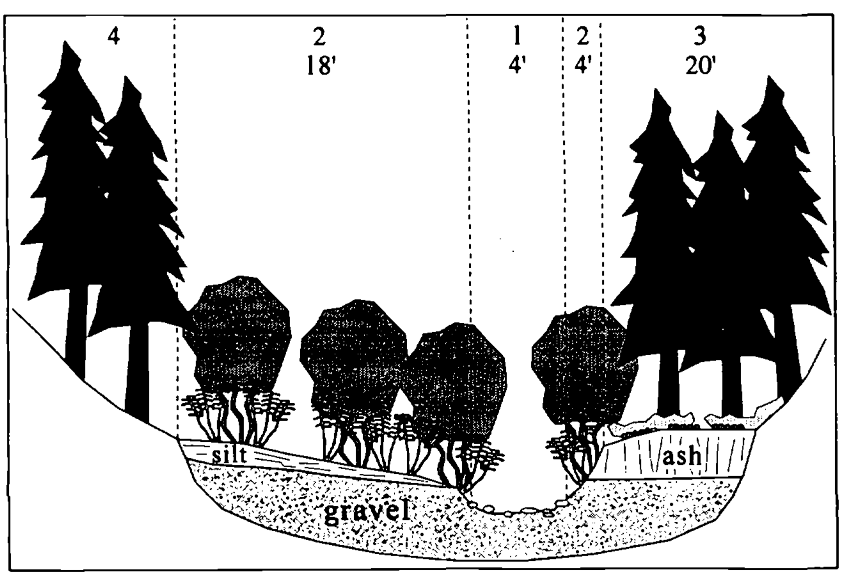
Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4836	542
Plot Aspect (°)	59	70
Plot Slope (%)	4	3
Valley Width (m)	35	28
Valley Gradient (%)	3	3
Valley Aspect (°)	32	66
Soil Surface Cover (%)		
Submerged	1	4
Bare Ground	4	8
Gravel	1	2
Moss	41	27
Litter	52	27

Soil Profile Characteristics

Bedrock/Parent Material(s) basalt, andesite, mixed sedimen.
Water Table Depth (cm) 23-51
Total Rooting Depth (cm) 13-46
Depth to Redoximorphic Features (cm) 0-33

Surface Layer

Thickness (cm) 5-33
Texture(s) very fine to coarse sandy loam, loamy sand silt loam, organic loam
Coarse Fragments (%) 0-50, gravel
Roots very fine: common to many fine: common to many
medium: none to many coarse: none to few



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

Figure 48. *Belshaw Creek, Long Creek RD, Malheur NF; mod. low gradient, mod. elevation, V-shaped valley; Xeric Central Highlands*

Redoximorphic Features	some iron concentrations
Subsurface Layer(s)	
Thickness (cm)	12-41
Texture(s)	organic loam, silt loam, silty clay loam, fine to coarse sandy loam
Coarse Fragments (%)	0-60, gravel
Roots	very fine: many; fine: few to many; medium: few to many; coarse: few
Redoximorphic Features	common iron oxidation and reduction
Substrate	gravel, cobble, sand

VEGETATION COMPOSITION

Principal Species		**Con**	**Cov**
Understory Tree Layer			
PIEN	Engelmann spruce	62	3
ABGR	Grand fir	38	2
Tall Shrubs			
ALIN	Mountain alder	100	63
RIHU	Stinking currant	100	27
RILA	Prickly currant	93	13
Perennial Forbs			
GEMA	Large-leaf avens	86	2
GATR	Sweet-scented bedstraw	86	2
SAAR4	Brook saxifrage	71	9
OSCH	Mountain sweet-cicily	64	2
MIPE	Alpine mitrewort	64	2
ACCO	Columbia monkshood	64	2
CIAL	Enchanter's nightshade	57	14
SETR	Arrow-leaf groundsel	57	12
STAM	Clasp-leaf twistedstalk	57	5
MIMO	Musk monkeyflower	57	1
ARCO	Heart-leaf arnica	50	9
VEAM	American speedwell	50	3
THOC	Western meadowrue	50	2
ACRU	Baneberry	43	3
SMST	Starry false-Solomon's seal	43	2
RAUN2	Wood buttercup	54	1
HELA	Common cowparsnip	43	2
ANAR2	Sharptooth angelica	43	2
FRVE	Woods strawberry	43	1
Perennial Grasses			
GLEL	Tall mannagrass	86	3
CILA2	Drooping woodreed	79	2
BRVU	Columbia brome	50	8
Sedges and Rushes			
CADE	Dewey's sedge	57	2
CADI	Soft-leaved sedge	50	6

Mountain alder is the shrub overstory (avg. 14 ft. tall) with a shrub understory of stinking and prickly currant (avg. 3 ft. tall). Stinking currant is an obligate wetland species in this wet association and has greater cover than prickly currant, which is a facultative wetland species (Reed 1988). Beneath the shrubs is a rich assemblage of moist and wet forbs, including large-leaf avens, sweet-scented bedstraw, clasp-leaf twistedstalk, alpine mitrewort, enchanter's nightshade, Columbia monkshood, wood buttercup, tall mannagrass, and drooping woodreed. 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, grand fir/grouse huckleberry-twinflower; sideslopes - subalpine fir/twinflower, subalpine fir/false bugbane, subalpine fir/big huckleberry, grand fir/twinflower, grand fir/pinegrass, grand fir/birchleaf spirea, grand fir/big huckleberry, grand fir/queen's cup beadlily and other grand fir associations.

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 67 to 1733 (avg. 774) lbs/acre. The herbaceous layer in this association is much sparser and less resilient than in mountain alder associations with rhizomatous species dominating the herbaceous understory. Heavy grazing of ALIN-RIBES/MESIC FORB reduces the diversity and cover of herbaceous species and mosses and compacts the soil. This may be detrimental to amphibian, small mammal and insect habitat along the stream. Prickly and swamp currants have low palatability for cattle and sheep and moderate palatability for deer and elk (U.S. Dept. of Commerce 1937). Heavy browsing of currants by elk has been observed in drainages where large herds of elk are resident most of the year. Elk and deer seem to prefer the leaves rather than the twigs of the plants.

ALIN-RIBES/MESIC FORB is a cool and wet plant association and, therefore, probably does not burn very frequently. Stinking currant and prickly currant response to fire is unknown.

Other species of currants are reported to provide good cover and feeding for birds and small mammals (Hansen and others 1995). Presumably the fruits are eaten by some animals.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded to Saturated.

OTHER STUDIES

The ALIN-RIBES/MESIC FORB association has not been described elsewhere. Kovalchik described the Mountain Alder Association in central Oregon (1987) and the Mountain Alder/Mesic Forb Association in eastern Washington (1992) both of which contain ALIN-RIBES/MESIC FORB communities.

Mountain Alder/Common Horsetail Plant Association

Alnus incana/Equisetum arvense SW2117
ALIN/EQAR n=4

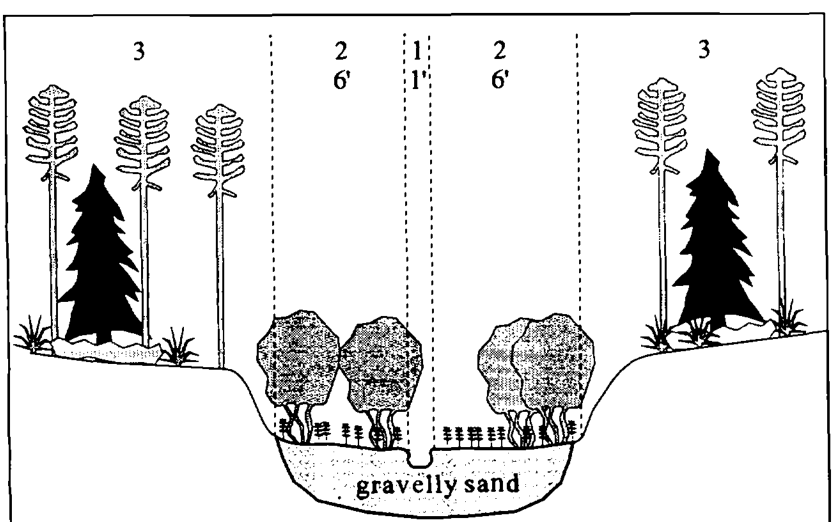
PHYSICAL ENVIRONMENT

The ALIN/EQAR association was sampled on the Baker, Wallowa Valley, and Unity RDs (Wallowa-Whitman NF) but may occur throughout the Blue Mountains at moderate elevations. Valleys in which ALIN/EQAR occurs are V- or trough-shaped. Valley gradients are 2-10%. Fluvial surfaces on which this type is found are streambanks, alluvial bars, and floodplains. Adjacent stream reach types are B2, B3, C3 and E5. Soils are shallow, skeletal, mineral alluvium over water-worked gravel and cobbles that remain wet throughout the growing season.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4655	655
Plot Aspect (°)	339	68
Plot Slope (%)	5	3
Valley Width (m)	110	162
Valley Gradient (%)	5	4
Valley Aspect (°)	342	69
Soil Surface Cover (%)		
Submerged	10	8
Bare Ground	1	1
Gravel	1	1
Rock	7	9
Moss	26	33
Liverwort	15	30
Litter	41	42

Soil Profile Characteristics

Bedrock/Parent Material(s)		basalt, diorite, sedimentary
Water Table Depth (cm)		20-25
Total Rooting Depth (cm)		20
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



1 A5 stream reach
2 **Mountain alder/common horsetail**, floodplain
3 Lodgepole pine/grouse huckleberry/pinegrass, north- and south-facing sideslopes

Figure 49. *Channel Creek, Baker RD, Wallowa-Whitman NF; very high gradient, mod. high elevation, trough-shaped valley; Mesic Forest Zone 1.*

VEGETATION COMPOSITION

Mountain alder forms a dense canopy over a rich ground cover of wet site herbs. Shrubs such as red-osier dogwood, prickly currant, and stinking currant may be scattered through the site. Tall mannagrass is the most prominent graminoid. Common horsetail has at least 25% cover. Other forbs include common monkey-flower, stream violet, sweet-scented bedstraw, and large-leaf avens. The herbaceous composition on streambanks may be determined in part by which species first colonized the site (Kovalchik 1987). Vegetation types adjacent to sites sampled are: terraces - ponderosa pine/Kentucky bluegrass, black cottonwood/mountain alder-red-osier dogwood; sideslopes - lodgepole pine(grand fir)/ grouse huckleberry/pinegrass, other grand fir associations and other ponderosa pine associations (upper slopes).

Principal Species		**Con**	**Cov**
Tall Shrubs			
ALIN	Mountain alder	100	41
Perennial Forbs			
MIGU	Common monkey-flower	100	1
VIGL	Stream violet	75	4
GEMA	Large-leaf avens	75	3
GATR	Sweet-scented bedstraw	75	2
MIMO	Musk monkey-flower	75	1
FRVE	Woods strawberry	75	1
Perennial Grasses			
GLEL	Tall mannagrass	100	33
Sedges and Rushes			
JUEN	Sword-leaf rush	100	2
CAMI	Small-winged sedge	75	3
Ferns and Horsetails			
EQAR	Common horsetail	100	48

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 1000 to 3248 (avg. 1718) lbs/acre. Common horsetail is not an important forage species for domestic livestock, and it is low in palatability to deer and elk. It is a minor to important component in the spring and early summer diet of black bears (Sullivan 1993).

Fire is probably infrequent in this moist to wet association. Above-ground plant parts of common horsetail are killed by most fires. The rhizomes are very deep (down to 6 ft. or deeper) and are not killed by even very hot fires. Common horsetail regenerates rapidly following fires and its abundance is usually unchanged to increased (Sullivan 1993).

Cover for wildlife by common horsetail is fair to poor (Sullivan 1993).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Seasonally Flooded to Saturated.

OTHER STUDIES

The ALIN/EQAR association has been described for eastern Washington by Kovalchik (1992). An ALIN/ EQAR community type has been described for Utah and southeastern Idaho by Padgett and others (1989) but grows on different soils and may not be an equivalent type to this one.

Mountain Alder-Common Snowberry Plant Association

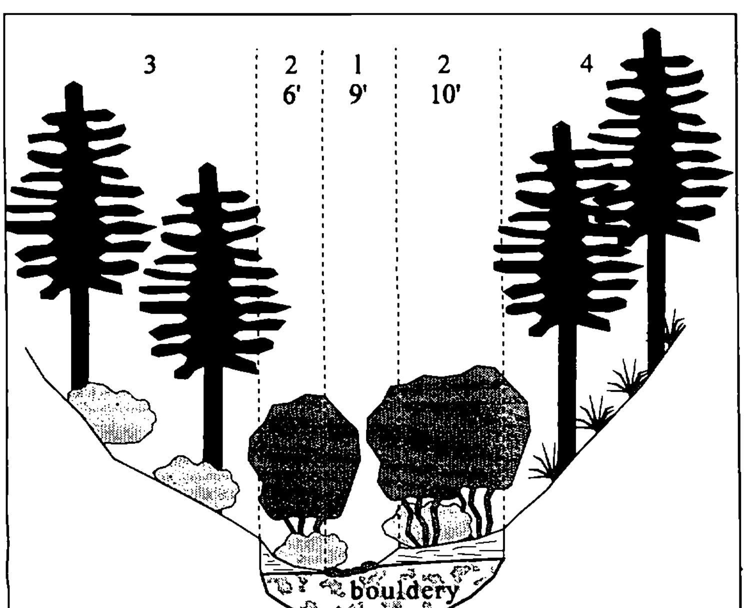
Alnus incana-Symphoricarpos albus SW2211
ALIN-SYAL n=9

PHYSICAL ENVIRONMENT

The ALIN-SYAL association is found at moderate elevations in the Blue Mountains. Plots were sampled on Bear Valley, Long Creek, and Burns RDs (Malheur NF) and Pomeroy and Walla Walla RD (Umatilla NF). Valleys in which the ALIN-SYAL type occurs are generally narrow and V-shaped with moderate to high gradients (2-7%) but can occasionally be broader and flat-shaped. ALIN-SYAL is found on floodplains and streambanks. Soils are Entisols (mainly Aquents and Fluvents). Soils consist of silt loam, loam to loamy sand mineral material that range from 15 to 90 cm deep over the old streambed. Mottling occurs from 20-70 cm. 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. Reach types of adjacent streams are A3, B2, B3, B4 and C4.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4092	796
Plot Aspect (°)	323	69
Plot Slope (%)	3	3
Valley Width (m)	78	105
Valley Gradient (%)	4	2
Valley Aspect (°)	34	73
Soil Surface Cover (%)		
Bare Ground	1	2
Rock	1	2
Moss	22	30
Litter	58	36

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt, unk. marine
Water Table Depth (cm)	33-58
Total Rooting Depth (cm)	31-81
Depth to Redoximorphic Features (cm)	7-70
Surface Layer	
Thickness (cm)	8-38
Texture(s)	silt loam, loam, gravelly sandy loam, sand
Coarse Fragments (%)	0-20, gravel



1 B2 stream reach
2 **Mountain alder-common snowberry**, floodplain
3 Douglas-fir/common snowberry, west-facing sideslope
4 Douglas-fir/pinegrass, east-facing sideslope

Figure 50. *Vestor Creek, Bear Valley RD, Malheur NF; high gradient, mod. elevation, V-shaped valley; Mesic Forest Zone I*

Roots	very fine: many; medium: few to common	fine: common to many; coarse: none to few
Redoximorphic Features		some iron concentrations

Subsurface Layer(s)

Thickness (cm)	18-70
Texture(s)	very fine to medium sandy loam, silt loam, loam, gravelly loamy sand
Coarse Fragments (%)	0-30, gravel
Roots	very fine: few to many; fine: common to many; medium: few to common; coarse: none to few
Redoximorphic Features	some iron oxidation

Substrate gravel, cobble

VEGETATION COMPOSITION

Mountain alder is the shrub overstory (avg. 20 ft. tall) with a shrub understory of common snowberry (avg. 5 ft. tall). Prickly currant, red-osier dogwood, bald-hip rose, and stinking currant are scattered through the shrub understory. The herbaceous layer includes Columbia monkshood, common cowparsnip, sharp-tooth angelica, heart-leaf arnica, large-leaf avens, and starry false-Solomon's seal. 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.

Principal Species		**Con**	**Cov**
Tall Shrubs			
ALIN	Mountain alder	100	66
SYAL	Common snowberry	100	46
COST	Red-osier dogwood	67	6
RILA	Prickly currant	56	15
RIHU	Stinking currant	44	3
ROGY	Bald-hip rose	33	7
Perennial Forbs			
ACCO	Columbia monkshood	67	7
GATR	Sweet-scented bedstraw	56	7
GEMA	Large-leaf avens	56	3
HELA	Common cowparsnip	56	2
OSCH	Mountain sweet-cicily	56	1
ANAR2	Sharptooth angelica	44	12
ARCO	Heartleaf arnica	44	7
Perennial Grasses			
ELGL	Blue wildrye	44	9
BRVU	Columbia brome	33	7
POPR	Kentucky bluegrass	33	7
Sedges and Rushes			
CADE	Dewey's sedge	67	21

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 50 to 433 (avg. 242) lbs/acre. Common snowberry is browsed by deer, elk, and cattle. It is a nutritious species for cattle late in the season but probably sustains the least damage if grazed in the spring. Common snowberry reproduces mainly by rhizomes and can increase or decrease following heavy grazing depending on the season and yearly moisture conditions (Snyder 1991).

Fires of low to moderate intensity will generally cause snowberry to sprout vigorously from its rhizomes. Severe fires may kill snowberry plants (Snyder 1991).

Snowberry provides good nesting cover for small mammals and many birds, including grouse, wild turkeys, and various songbirds. The fruits are eaten by quail, pheasant, grouse, and other animals (Snyder 1991).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded.

OTHER STUDIES

The ALIN-SYAL association was described for central Oregon by Kovalchik (1987).

Mountain Alder/Dewey's Sedge Plant Community Type

Alnus incana/Carex deweyana SW2118
ALIN/CADE n=4

PHYSICAL ENVIRONMENT

The ALIN/CADE community type was sampled on Pomeroy and Walla Walla RDs (Umatilla NF), Prairie City RD (Malheur NF), and La Grande RD (Wallowa-Whitman NF), but may occur at low to moderate elevation throughout the middle and northern Blue Mountains. ALIN/CADE occurs in narrow V- or trough-shaped valleys with gradients of 1-3% and steep to very steep side slopes. Fluvial surfaces on which ALIN/CADE grows are either cobbly, convexly-shaped alluvial bars, or floodplains with shallow silt loam or sandy loam mineral deposits over water-worked cobbles and gravel. Soils are Entisols. Flood water may cover the surface of the bar or floodplain in the late winter and early spring, but the water table drops to well below the surface by late summer. The physical characteristics of this community type are similar to the ALIN/EQAR association except that it occurs at lower elevations and has a lower water table. Stream types associated with ALIN/CADE sites are B2, B3, B4 andC3. Streams are 5-30 ft. wide with small to medium-sized debris affecting less than 10% of the active channel area.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	3700	895
Plot Aspect (°)	191	42
Plot Slope (%)	11	20
Valley Width (m)	99	68
Valley Gradient (%)	2	0
Valley Aspect (°)	124	50
Soil Surface Cover (%)		
Bare Ground	4	5
Gravel	1	1
Rock	21	36
Moss	14	18
Litter	60	37

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt, andesite
Water Table Depth (cm)	83
Total Rooting Depth (cm)	63
Depth to Redoximorphic Features (cm)	70
Surface Layer	
Thickness (cm)	70
Texture(s)	fine sandy loam
Coarse Fragments (%)	0
Redoximorphic Features	40% iron concentrations
Subsurface Layer(s)	none
Substrate	cobble, gravel

VEGETATION COMPOSITION

Mountain alder forms a dense canopy over scattered moist forbs and graminoids, including Dewey's sedge. Small amounts of red-osier dogwood, stinking and prickly currant may occur in the shrub understory. Forbs and graminoids include common cowparsnip, mountain sweet-cicily, sweet-scented bedstraw, large-leaf avens, Columbia brome, nodding fescue, and blue wildrye. Vegetation types adjacent to sites sampled are: terraces - black cottonwood-ponderosa pine, black cottonwood-Engelmann spruce, Douglas fir/Rocky Mountain maple-mallow ninebark-floodplain, grand fir/Rocky Mountain maple-floodplain; sideslopes - grand fir/Rocky Mountain maple, grand fir/queen's cup beadlily, Douglas-fir/mallow ninebark and ponderosa pine associations.

Principal Species		Con	Cov
Tall Shrubs			
ALIN	Mountain alder	100	88
COST	Red-osier dogwood	75	5
RUPA	Thimbleberry	50	30
RIHU	Stinking currant	50	3
RILA	Prickly currant	50	3
Perennial Forbs			
OSCH	Mountain sweet-cicily	100	2
GATR	Sweet-scented bedstraw	75	4
HELA	Common cowparsnip	75	3
GEMA	Large-leaf avens	75	2
MOCO	Heart-leaf miner's lettuce	75	1
URDI	Stinging nettle	75	1
SETR	Arrow-leaf groundsel	75	1
ACMI	Yarrow	75	1
MIST2	Side-flowered mitrewort	50	13
SMRA	Feathery Solomon-plume	50	10
CIAL	Enchanter's nightshade	50	2
ACRU	Baneberry	50	2
TITRU	Coolwort foamflower	50	2
VIGL	Stream violet	50	2
Perennial Grasses			
ELGL	Blue wildrye	75	1
FESU	Nodding fescue	50	13
BRVU	Columbia brome	50	1
Sedges and Rushes			
CADE	Dewey's sedge	100	13
CAMI	Small-winged sedge	50	1
Ferns and Horsetails			
EQAR	Common horsetail	75	9
ATFI	Lady fern	75	4

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 433 to 1333 (avg. 1014) lbs/acre. Dewey's sedge is a tufted, soft-leaved sedge and is probably succulent forage for grazing animals but would not survive heavy use.

The high moisture and low cover of the herbaceous plants and the cobbly surface of the sites probably prevents frequent fires from occurring. Response of Dewey's sedge to fire is unknown.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded.

OTHER STUDIES

The ALIN/CADE community type has not been previously described.

Mountain Alder/Kentucky Bluegrass Plant Community Type

Alnus incana/Poa pratensis SW2120
ALIN/POPR n=8

PHYSICAL ENVIRONMENT

The mountain alder/Kentucky bluegrass plant community type was sampled on Bear Valley and Prairie City RDs (Malheur NF) and La Grande and Wallowa Valley RDs (Wallowa-Whitman NF). Representative plots were sampled at moderate elevations (3500-5150 ft.) in 100-1000 ft. wide, trough-, flat- and V-shaped valleys. Adjacent stream reach types (B4c, C3, C4, C5 and E6's) are lower gradient than those adjacent to other mountain alder associations. Streams were 5-50 ft. wide with organic debris affecting up to 30% of the active channel.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4218	641
Plot Aspect (°)	57	71
Plot Slope (%)	2	1
Valley Width (m)	136	132
Valley Gradient (%)	2	1
Valley Aspect (°)	49	76
Soil Surface Cover (%)		
Bare Ground	4	4
Gravel	3	7
Rock	6	14
Moss	11	20
Litter	65	38

Soil Profile Characteristics

Bedrock/Parent Material(s)		basalt, sedimentary, mixed alluvium
Water Table Depth (cm)		38-76
Total Rooting Depth (cm)		10-40
Depth to Redoximorphic Features		18-42
Surface Layer		
Thickness (cm)		10-23
Texture(s)		silt loam
Coarse Fragments (%)		0
Roots	very fine: few to many	fine: many
	medium: none to many	coarse: none to few
Redoximorphic Features		none
Subsurface Layer(s)		
Thickness (cm)		8-80
Texture(s)		silt loam, fine to coarse sandy loam, loamy sand
Coarse Fragments (%)		0-30, gravel
Roots	very fine: none to many	fine: many
	medium: none to common	coarse: none to few
Redoximorphic Features		some iron concentrations
Substrate		gravel, cobble

VEGETATION COMPOSITION

Mountain alder/Kentucky bluegrass is a grazing-induced seral stage of other mountain alder types; mountain alder/common cowparsnip and mountain alder-currants/mesic forb are often the likely potential. Mountain alder forms a scattered shrub layer over a carpet of Kentucky bluegrass and forbs, including yarrow, large-leaf avens, common cowparsnip and starry false-Solomon's seal. Many of the forbs found on these sites are increasers under grazing disturbance. Vegetation types adjacent to sites sampled are: terraces - Engelmann spruce/common horsetail, black hawthorn, grand fir/Rocky Mountain maple-mallow ninebark-floodplain, subalpine fir associations; sideslopes - grand fir/pinegrass, grand fir/common snowberry and other grand fir and lodgepole pine types.

Principal Species		Con	Cov
Tall Shrubs			
ALIN	Mountain alder	100	51
RIIR	Idaho gooseberry	50	2
Perennial Forbs			
GATR	Sweet-scented bedstraw	88	2
ACMI	Yarrow	75	3
GEMA	Large-leaf avens	75	3
HELA	Common cowparsnip	63	8
SMST	Starry false-Solomon's seal	50	25
URDI	Stinging nettle	50	5
SEPS	Streambank butterweed	50	5
ACCO	Columbia monkshood	50	3
THOC	Western meadowrue	50	2
FRVI	Broadpetal strawberry	50	2
OSCH	Mountain sweet-cicily	50	1
RAUN2	Wood buttercup	50	1
VIGL	Stream violet	50	1
TAOF	Common dandelion	50	1
Perennial Grasses			
POPR	Kentucky bluegrass	88	46
ELGL	Blue wildrye	50	13
PHPR	Common timothy	50	3
GLEL	Tall mannagrass	50	2
Ferns and Horsetails			
EQAR	Common horsetail	63	1

MANAGEMENT CONSIDERATIONS

Total herbaceous biomass ranged from 300-4511 lbs./acre (avg. 1775 lbs./acre). Kentucky bluegrass dominance on a site is usually the result of heavy grazing, especially when destabilization of the stream banks and bed occurs and results in lowering of the water table. Other ground disturbances that can favor Kentucky bluegrass domination are heavy machinery use associated with logging, mining or road-building, off-road vehicle use, and repeated or large-scale camping. Kentucky bluegrass is highly palatable to livestock, elk, pronghorn, mule deer, and white-tailed deer (Uchytil 1993), and is most nutritious in the spring but remains fairly nutritious throughout the summer on moist sites. It is highly resistant to grazing (Uchytil 1993). With severe overgrazing Kentucky bluegrass can decrease in abundance and be replaced by forbs (Kovalchik 1987). Once established, it is aggressive and difficult to replace with native vegetation. On sites where the water table has been lowered through stream degradation, raising the water table to its original level may allow the original understory vegetation to reestablish.

Kentucky bluegrass is moderately resistant to fire. Seed production and rhizome growth may be stimulated by fires. When plants are dormant, cool fires have little effect. There is evidence that late spring burning, when plants have reached full development and major food reserves have been depleted, causes the most injury to plants. Repeated late spring burning can actually rid a site of Kentucky bluegrass. If the site receives ample moisture after the fire, however, burning may have no effect or may increase the bluegrass abundance (Uchytil 1993).

Small mammals and birds may find good cover and foraging in Kentucky bluegrass stands. Leaves and seeds are eaten and can be an important food for cottontail rabbits. Open stands of Kentucky Bluegrass are good habitat for the northern pocket gopher, the Columbia ground squirrel, and mice species, which in turn makes good foraging grounds for raptors (Uchytil 1993).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded.

OTHER STUDIES

This type has not been previously described.

Miscellaneous Alder Types

Sitka Alder/Mesic Forb Plant Community Type

Alnus sinuata/Mesic Forb
ALSI/MESIC FORB n=4

ALSI/MESIC FORB occurs in locations somewhat similar to ALSI/ATFI, but the sites are drier and don't support lady fern. Sites were sampled at moderate to high elevations (4100-5400 ft.) in narrow, moderate to high gradient valleys. ALSI/MESIC FORB is usually found in the upper parts of drainages on banks or floodplains. Associated Rosgen stream types are narrow B3 types with moderate amounts of large woody debris affecting the channels. Soils are coarse fragment-rich silt loam or loam over water-worked cobbles and gravel. Sitka alder (ALSI) (sometimes together with mountain alder [ALIN]) forms a dense canopy over a variety of mesic forbs and graminoids, including stream violet (VIGL), western meadowrue (THOC), western coneflower (RUOC), sweet-scented bedstraw (GATR), enchanter's nightshade (CIAL), starry false-Solomon's seal (SMST), nodding fescue (FESU), tall mannagrass (GLEL), and silvery sedge (CACA4). Adjacent sideslope vegetation types are grand fir and subalpine fir-Engelmann spruce associations. The ALSI/MESIC FORB Association has been described in eastern Washington by Kovalchik (1992).

Mountain Alder/Aquatic Sedge Community

Alnus incana/Carex aquatilis
ALIN/CAAQ n=1

The ALIN/CAAQ community was sampled on Burns RD (Malheur NF) on the edge of Wolf Creek Meadow. The site is a spring with very wet mineral (ash) soil overlain by a thin organic cap. The 20 ft. tall mountain alder (ALIN) canopy partially shades a mixture of aquatic sedge (CAAQ), clustered field sedge (CAPR5), Jeffrey's shooting star (DOJE), straight-beak buttercup (RAOR), long-stalked clover (TRLO), and other wet forbs. The ALIN/CAAQ community has not been previously described.

Mountain Alder/Wood-rush Sedge Community

Alnus incana/Carex luzulina
ALIN/CALU n=1

This ALIN/CALU community was sampled on Unity RD (Wallowa-Whitman NF) in a moderately wide trough-shaped valley. The site is an abandoned channel with a shallow mineral soil and a high water table. The moderately open mountain alder (ALIN) overstory has a dense herbaceous understory of wood-rush sedge (CALU), Baltic rush (JUBA), slender muhly (MUFI), Nebraska sedge (CANE), golden sedge (CAAU), and scattered forbs. The ALIN/CALU community has not been previously described.

Mountain Alder/Woolly Sedge Plant Association

Alnus incana/Carex lanuginosa SW2123
ALIN/CALA3 n=3

ALIN/CALA3 sites were sampled on Burns and Bear Valley RDs (Malheur NF) and Unity RD (Wallowa-Whitman NF) at moderately high elevations (4000-5230 ft.) Valleys in which ALIN/CALA3 occurs are low gradient, V- or trough-shaped, narrow to wide with gentle to moderately steep side slopes. Associated Rosgen stream types are 1-30 ft. wide E5 and B streams with little organic debris affecting the active stream channel. Soils are 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. Mountain alder (ALIN) forms a scattered to dense canopy over 10-30% woolly sedge (CALA3) with

Baltic rush (JUBA), small-winged sedge (CAMI), Kentucky bluegrass (POPR), large-leaf avens (GEMA), yarrow (ACMI), starry false-Solomon's seal (SMST), and other mesic forbs and graminoids. Adjacent sideslope vegetation types are ponderosa pine associations. The ALIN/CALA3 association has not been previously described.

Mountain Alder/Bluejoint Reedgrass Plant Association

Alnus incana/Calamagrostis canadensis SW2121
ALIN/CACA n=3

ALIN/CACA sites were sampled at moderate to high elevations (4500-5220 ft.) on the Baker, Pine, and Hells Canyon NRA RDs (Wallowa-Whitman NF). This association probably occurs elsewhere in the Blue and Wallowa Mountains. Valleys in which this association occurs are wide and low gradient and contain 15-75 ft. 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. Mountain alder (ALIN) forms an open to moderately closed canopy over a dense stand of bluejoint reedgrass (CACA). Other herbaceous species include western coneflower (RUOC), sharptooth angelica (ANAR2), large-leaf avens (GEMA), sweet-scented bedstraw (GATR), tall mannagrass (GLEL), and common horsetail (EQAR). Vegetation types adjacent to sites sampled are: terraces - lodgepole pine (grand fir)/pinegrass, subalpine fir-Engelmann spruce; sideslopes - lodgepole pine (grand fir)/grouse huckleberry/pinegrass and subalpine fir-Engelmann spruce associations. ALIN/CACA has also been described as a miscellaneous plant association for eastern Washington by Kovalchik (1992).

Mountain Alder/Small-fruit Bulrush Plant Community Type

Alnus incana/Scirpus microcarpus SW2122
ALIN/SCMI n=2

ALIN/SCMI was sampled on streambanks and in a spring on the Burns and Prairie City RDs (Malheur NF) on both mineral and organic soils. Sites are very wet with the water table at or above the soil surface much of the growing season. Valleys in which ALIN/SCMI was sampled were moderately steep and narrow with steep side slopes. The vegetation consists of an open to closed shrub overstory of mountain alder (ALIN) with a scattering of currants (RIBES) in the shrub understory. Herbaceous cover is dominated by small-fruit bulrush (SCMI) with small amounts of large-leaf avens (GEMA), common willow-herb (EPGL2), broad-petal strawberry (FRVI), starry false-Solomon's seal (SMST), and soft-leaved sedge (CADI). Adjacent sideslope vegetation types are grand fir associations. The ALIN/SCMI community type has been included as a miscellaneous plant association in eastern Washington by Kovalchik (1992).

Mountain Alder/Densely-tufted Sedge Plant Community

Alnus incana/Carex lenticularis var. *lenticularis*
ALIN/CALEL2 n=1

ALIN/CALEL2 is a miscellaneous community consisting of a fairly open canopy of mountain alder (ALIN) (20 ft. tall) with red-osier dogwood (COST), currants (RIBES), snowberry (SYAL) and coyote willow (SAEX) scattered through the shrub understory. The fluvial surface is a rocky floodplain and is covered by an herbaceous layer of densely-tufted sedge (CALEL2), Jones' sedge (CAJO), field mint (MEAR3), musk monkey-flower (MIMO), common self-heal (PRVU), and fowl mannagrass (GLST). The associated stream is a moderately high gradient B stream about 10 ft. wide with 20-30% medium to large size woody debris affecting the active stream channel. This community was sampled on Ditch Creek, Heppner RD (Umatilla NF). It has not been described elsewhere.

Mountain alder/Oakfern Plant Community Type

Alnus incana/Gymnocarpium dryopteris
ALIN/GYDR n=2

The mountain alder/oakfern community type was sampled on Pomeroy RD (Umatilla NF) at a mean elevation of 3500 ft. It occurs on narrow floodplains in moderately narrow, high gradient (7%) V-shaped valleys adjacent to A and B-type streams (A2 and B3 for sites sampled). Streams were about 10-20 ft. wide with woody debris affecting 10-30% of the active channel. Mountain alder (ALIN) forms a dense shrub overstory with 15-20% oakfern (GYDR) cover among a mixture of other wet sites forbs, including Sitka valerian (VASI), stream violet (VIGL) enchanter's nightshade (CIAL), false bugbane (TRCA3), coolwort foamflower (TITRU), starry false-Solomon's seal (SMST), heartleaf miner's lettuce (MOCO) and longstalk clover (TRLO). Generally this community is adjacent to a grand fir/oakfern terrace.

Mountain Alder/Common Cowparsnip Plant Community Type

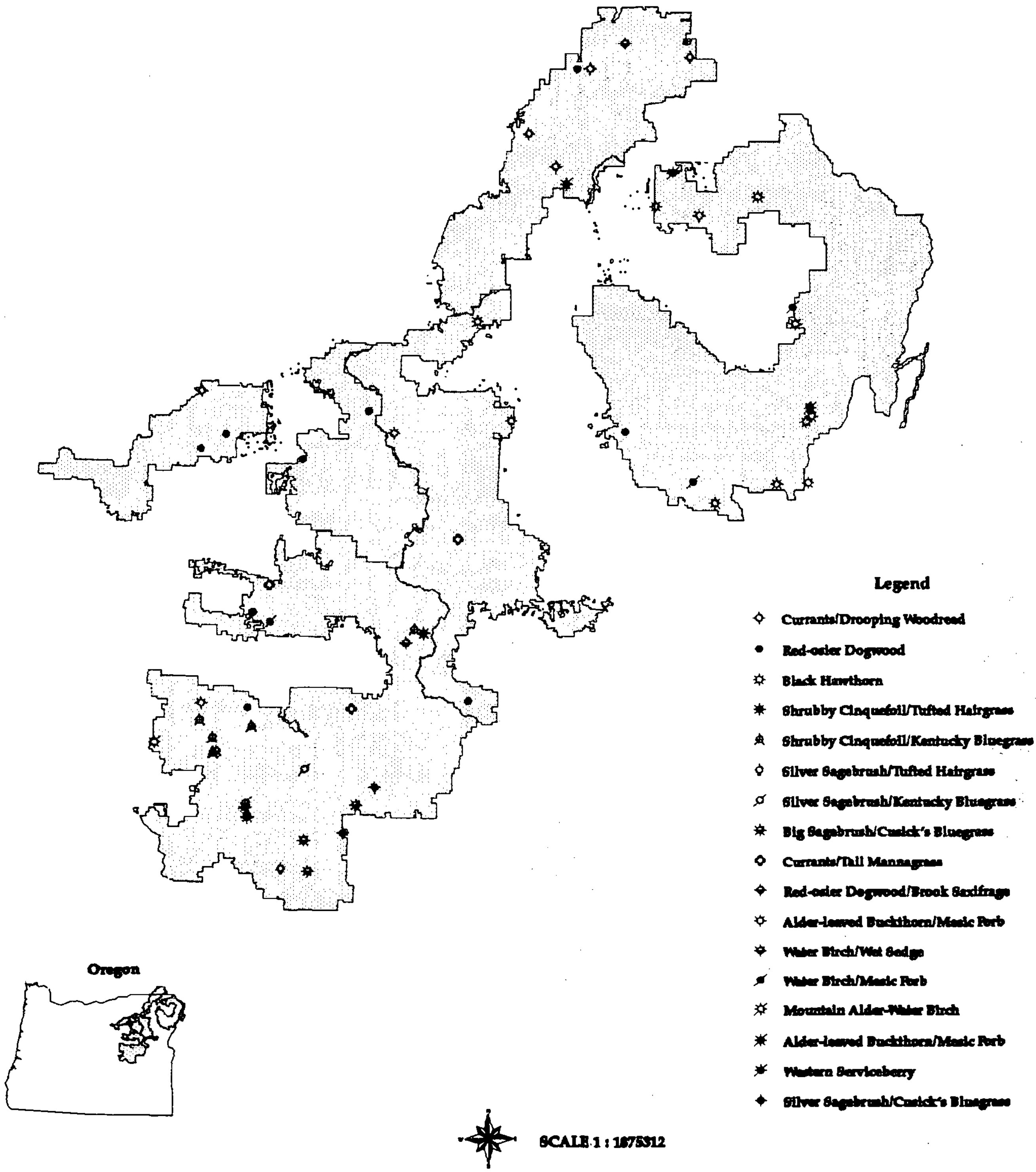
Alnus incana/Heracleum lanatum SW2124
ALIN/HELA n=4

The ALIN/HELA community type was sampled on Burns and Prairie City RDs (Malheur NF) and on Pomeroy RD (Umatilla NF) at elevations ranging from 3010 to 5130 ft. It occurs in moderately wide (approx. 100-200 ft.), moderate gradient (2%), V- and trough-shaped valleys with steep side slopes. Adjacent stream reach types were B2, A3 and B5 with 5-30 ft. Wide channels and woody debris affecting 10-30% of the active channel. Depth to the buried stream bed varied from 15-25 cm. Mountain alder (ALIN) forms a dense shrub layer (45-90% cover) with common cowparsnip cover of 10-45% underneath. Other common forbs and graminoids include starry false-Solomon's seal (SMST), sweet-scented bedstraw (GATR), stinging nettle (URDI), large-leaf avens (GEMA), western meadowrue (THOC), small-wing sedge (CAMI) and miner's lettuce (MOPE).

Figure 51. Facing page
Sample sites for the remaining shrub types. This map does not represent the actual distribution of the miscellaneous shrub types.

Remaining Shrubs Plant Associations,

Community Types & Communities



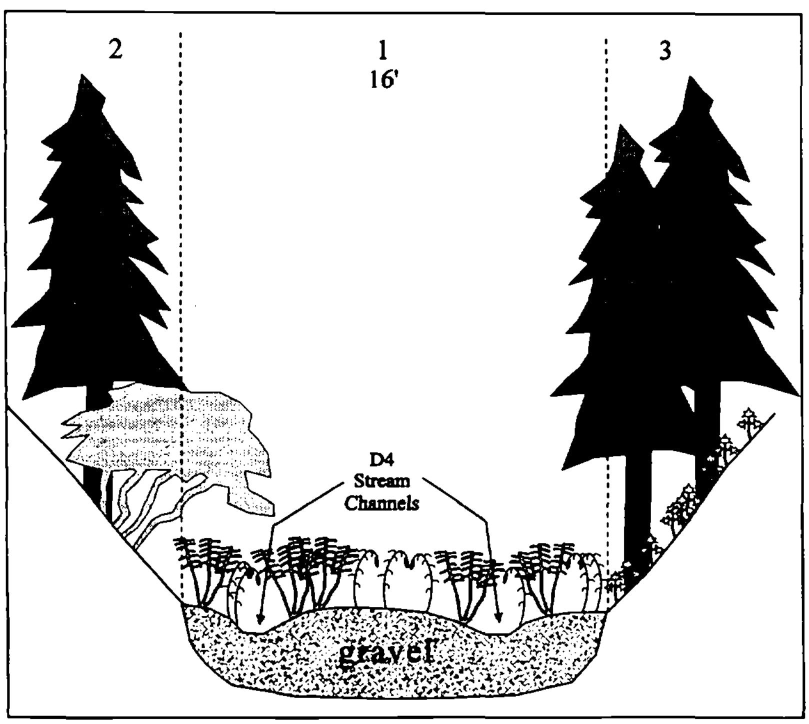
Currants/Drooping Woodreed Plant Community Type

Ribes ssp./*Cinna latifolia* SW5111
RIBES/CILA2 n=5

PHYSICAL ENVIRONMENT

The RIBES/CILA2 community type occurs in the northern half of the Blue Mountains (Walla Walla, Pomeroy, and Heppner RDs, Umatilla NF). Valley types in which RIBES/CILA2 is found are very narrow and V-shaped with moderately steep to very steep side slopes. Valley gradients are moderately steep to very steep (2-10%). Fluvial surfaces on which this type occurs are floodplains, streambanks, and gravel bars. Stream reach types associated with RIBES/CILA2 are A2, B3, B4, and D4. Boulder, cobble, and gravel bedloads are predominant. Streams are 1-15 ft. 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 that grade into water-worked cobbles and gravel at the level of the old stream bed. Soils remain relatively wet throughout the growing season. Sites are often flooded during peak runoff.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4472	209
Plot Aspect (°)	346	79
Plot Slope (%)	9	11
Valley Width (m)	14	8
Valley Gradient (%)	4	3
Valley Aspect (°)	11	75
Water Table Depth (cm)	40	18
Depth to Mottling (cm)	20	—
Soil Surface Cover (%)		
Submerged	4	5
Bare Ground	3	2
Gravel	2	3
Rock	2	2
Moss	43	35
Liverwort	6	7



1 **Currants/drooping woodreed**, floodplain
2 Grand fir/Rocky Mtn. maple, northwest-facing toeslope
3 Grand fir/oakfern, southeast-facing toeslope

Figure 52. *N. Fk. Walla Walla River, Walla Walla RD, Umatilla NF; mod. low gradient, mod. elevation, V-shaped valley; Mesic Forest Zone 2.*

Lichen	1	1
Litter	34	36

Soil Profile Characteristics

Bedrock/Parent Material(s)		basalt, andesite
Water Table Depth (cm)		20-56
Total Rooting Depth (cm)		8-56
Depth to Redoximorphic Features		20
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

VEGETATION COMPOSITION

The RIBES/CILA2 community type is sometimes seral to ALSI/ATFI or ALSI/CILA2. In these situations, ALSI is scattered through the community with low total coverage. Currants form a scattered canopy over a rich mixture of graminoids and wet forbs. Drooping woodreed is generally abundant and is about 3 ft. tall. Wet forbs include brook saxifrage, Columbia monkshood, stinging nettle, heart-leaf miner's lettuce, alpine mitrewort, and common cowparsnip. 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.

Principal Species		**Con**	**Cov**
Tall Shrubs			
RILA	Prickly currant	100	13
RIHU	Stinking currant	60	39
ALIN	Mountain alder	60	8
RUPA	Thimbleberry	40	12
Perennial forbs			
SAAR4	Brook saxifrage	100	6
ACCO	Columbia monkshood	100	1
URDI	Stinging nettle	80	2
MOCO	Heart-leaf miner's lettuce	60	16
MIPE	Alpine mitrewort	60	6
HELA	Common cowparsnip	60	5
TITRU	Cool-wort foam-flower	60	4
EPGL2	Common willow-herb	60	4
CIAL	Enchanter's nightshade	60	4
SETR	Arrowleaf groundsel	60	4
Perennial Grasses			
CILA2	Drooping woodreed	100	25
GLEL	Tall mannagrass	40	4

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 150 to 2100 (avg. 1280) lbs/acre. Drooping woodreed does not appear to be highly palatable to wild ungulates or domestic livestock.

Fire is infrequent in this cool, wet, community type. Drooping woodreed is rhizomatous and would likely resprout if above-ground plant parts were killed by fire. The rhizomes are generally in moist to saturated soils and would be protected except when very hot fires occur during droughty years.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded.

OTHER STUDIES

The RIBES/CILA2 Community Type has not been previously described.

Red-osier Dogwood Plant Association

Cornus stolonifera	SW5112
COST	n=9

PHYSICAL ENVIRONMENT

The COST association was sampled at moderate elevations throughout the Blue and Wallowa Mountains (Bear Valley and Long Creek RDs, Malheur NF; Heppner, North Fork John Day, and Pomeroy RDs, Umatilla NF; Unity, Pine, LaGrande and Baker RDs, Wallowa-Whitman NF). Valleys in which the COST association occurs are generally narrow, V-shaped, and high gradient (2-10%). Side slopes are moderately steep to steep. The COST association is found on floodplains and streambanks adjacent to A2, A4, A5, B2 and B3 stream reach types. Streams are 1-15 ft. wide with small to moderately-sized woody debris affecting from less than 10% up to 30% of the stream channel. Soils are Entisols (Oxyaquic Udorthents, Endoaquents, Aquic Udorthents, Fluvaquents), two Hapludands, and one Mollisol. Soil textures are silt loam to loamy sand grading into water-worked cobbles and gravel. Some sites are bouldery or cobbly streambanks with few fines. Water holding capacity is generally low but the soils remain moist well into the growing season. Sites are often flooded during peak runoff. Red-osier dogwood needs fresh, aerated water to establish and probably seasonally aerated (non-saturated) soils to thrive.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4223	771
Plot Aspect (°)	98	68
Plot Slope (%)	8	8
Valley Width (m)	50	62
Valley Gradient (%)	5	3
Valley Aspect (°)	105	77

Soil Surface Cover (%)		
Submerged	1	2
Bare Ground	4	7
Gravel	1	2
Rock	9	15
Moss	27	32
Liverwort	1	2
Litter	52	29

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, andesite, rhyolite, unknown sedimentary and marine
Water Table Depth (cm)	56-60
Total Rooting Depth (cm)	20-46
Depth to Redoximorphic Features	10-13
Surface Layer	
Thickness (cm)	8-56
Texture(s)	silt loam, loam, coarse loamy sand
Coarse Fragments (%)	0-75, gravel
Roots	very fine: common to many fine:few to many medium: none to few coarse: none to few
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	12-38
Texture(s)	loam, coarse loamy sand
Coarse Fragments (%)	0-15, gravel
Roots	very fine: few to many fine: few to common medium: none to common coarse: few to many
Redoximorphic Features	some iron concentrations
Substrate	gravel, cobble, silty clay

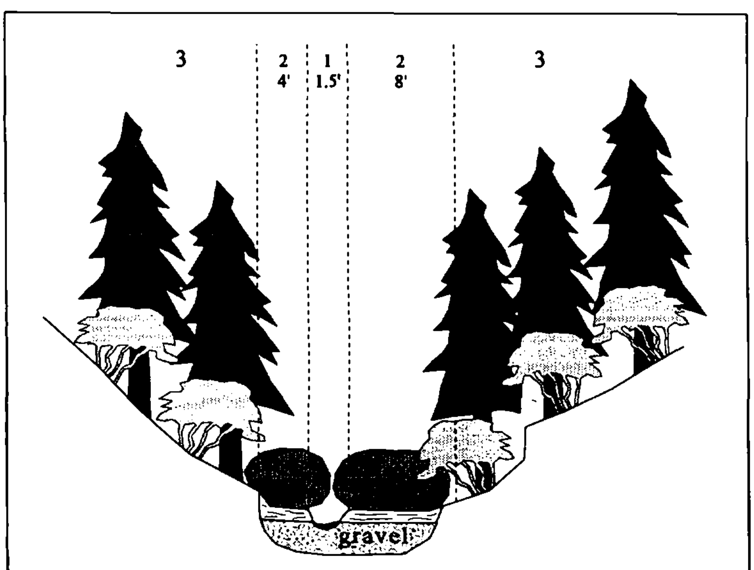


Figure 53. *Trib. to N. Fk. West Camp Creek, Unity RD, Wallowa-Whitman NF; mod. high gradient, mod. high elevation, V-shaped valley; Mesic Forest Zone 1.*

1 A4 stream reach
2 **Red-osier dogwood**, banks
3 Grand fir/Rocky Mtn. maple, south- and north-facing sideslopes

VEGETATION COMPOSITION

Red-osier dogwood forms a scattered to dense overstory canopy (avg. 8 ft. tall). Rocky mountain maple is occasionally a shrub overstory co-dominant. Common snowberry may form a dense shrub understory at low elevations. Prickly currant, stinking currant, and thimbleberry are scattered through the shrub understory. The herbaceous layer varies from site to site. There is always a mix of mesic forbs and graminoids including sweet-scented bedstraw, enchanter's nightshade, starry false-Solomon's seal, baneberry, large-leaf avens, tall mannagrass, drooping woodreed, and ladyfern. Occasionally tall mannagrass dominates. The COST association is often interspersed among mountain alder associations along a stream, especially where an exceptionally steep (B type) sunny stretch occurs. This can be a natural occurrence or can be created by the building of a road immediately adjacent to a stream in a steep, narrow, V-shaped valley. Vegetation types adjacent to sites sampled are: terraces - grand fir/queen's cup beadlily, grand fir/Rocky Mountain maple-floodplain; sideslopes - grand fir/big huckleberry, grand fir/Rocky Mountain maple, grand fir/twinflower, grand fir/mallow ninebark, grand fir/queen's cup beadlily, grand fir/birchleaf spirea, Douglas-fir/mallow ninebark, Douglas-fir/elk sedge and Douglas-fir/mountain snowberry.

Principal Species		**Con**	**Cov**
Tall Shrub			
COST	Red-osier dogwood	100	68
SYAL	Common snowberry	78	8
RILA	Prickly currant	78	4
RIHU	Stinking currant	44	16
ACGL	Rocky mountain maple	33	26
Perennial Forbs			
GATR	Sweet-scented bedstraw	78	4
ACRU	Baneberry	67	5
CIAL	Enchanter's nightshade	67	4
SMST	Starry false-Solomon's seal	56	9
ACCO	Columbia monkshood	56	4
HELA	Common cowparsnip	56	3
STAM	Clasp-leaf twisted stalk	44	2
GEMA	Large-leaf avens	44	1
OSCH	Mountain sweet-cicily	44	1
Perennial Grasses			
GLEL	Tall mannagrass	44	12
CILA2	Drooping woodreed	44	5

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 100 to 2300 (avg. 1061) lbs/acre. It is obviously highly variable and depends on the density of the red-osier dogwood canopy, the gradient of the site, and the soil texture. Red-osier dogwood is relatively unpalatable to livestock but will be browsed when more desirable forage species are lacking. Mule deer are heavy browsers of leaves and sprouts of red-osier dogwood in the summer and light browsers in the fall and winter. Elk browse red-osier dogwood in the winter.

Red-osier dogwood can sprout from surviving roots, stolons, and the bases of aerial stems following fire. It is a seed-banking species and light fires that partially remove the duff layer can stimulate germination of buried seeds. The roots will survive all but the most severe fires and fires that cause extended heating of the upper part of the soil profile. Red-osier dogwood generally increases in abundance following burning (Crane 1989).

Red-osier dogwood provides food and cover for mule deer, elk, mountain goats, cottontail rabbits, snowshoe hares, and many birds, including bobwhite, ring-necked pheasants, wild turkeys, and grouse. The fruits are an important black bear food and are also eaten by songbirds, grouse, quail, partridge, cutthroat trout, ducks, crows, mice, and other mammals. The young stems and bark are eaten by deer mice, meadow voles, and other small rodents. Red-osier dogwood often grows in dense thickets because of its layering ability. These thickets provide good mule-deer fawning and rearing areas and nesting habitat for many songbirds (Crane 1989).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily to Intermittently Flooded.

OTHER STUDIES

The COST association has been described by Kovalchik for eastern Washington (1992). Similar COST associations have been described for Montana (Hansen and others 1995), Utah, southeastern Idaho and western Wyoming (Padgett and others 1989, Youngblood and others 1985,) Nevada (Manning and Padgett 1995) and southwest Washington and northwest Oregon (Diaz and Mellon 1996).

Black Hawthorn Plant Community Type

Crataegus douglasii SW3111
CRDO n=9

PHYSICAL ENVIRONMENT

The black hawthorn community type was sampled at low to moderate elevations in the Wallowa Mountains (Wallowa Valley and Pine RDs and Hells Canyon NRA, Wallowa-Whitman NF). Valleys in which the black hawthorn community type occurs are low to high gradient (1-7%), moderately wide, and V- or flat-shaped with moderately steep to steep side slopes. Fluvial surfaces are terraces, floodplains, and moist basins. Soils are Mollisols, Andisols, Entisols and Inceptisols, consisting of silt loam to loamy gravel mineral material that ranges from 0 to more than 60 cm deep over the old stream bed. These sites are infrequently flooded and the water table is 2-5 ft. below the soil surface by mid-summer. Stream reach types of adjacent streams are B3, B4, C3, G3 and F4. Streams are 5-30 ft. wide with less than 10% of the active channel affected by woody debris.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	3609	448
Plot Aspect (°)	74	73
Plot Slope (%)	4	3
Valley Width (m)	75	49
Valley Gradient (%)	3	3
Valley Aspect (°)	131	66
Soil Surface Cover (%)		
Bare Ground	7	10
Gravel	1	2
Rock	1	2
Moss	17	28
Litter	74	27

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, mixed metamorph., igneous extrusive, alluvium
Total Rooting Depth (cm)	15-41
Depth to Redoximorphic Features	31
Surface Layer	
Thickness (cm)	5-38
Texture(s)	silty clay loam, silt loam, sandy loam, gravelly loam
Coarse Fragments (%)	0-40, gravel, boulders
Roots	very fine: many; fine: common to many; medium: few to common; coarse: none to common
Redoximorphic Features	none

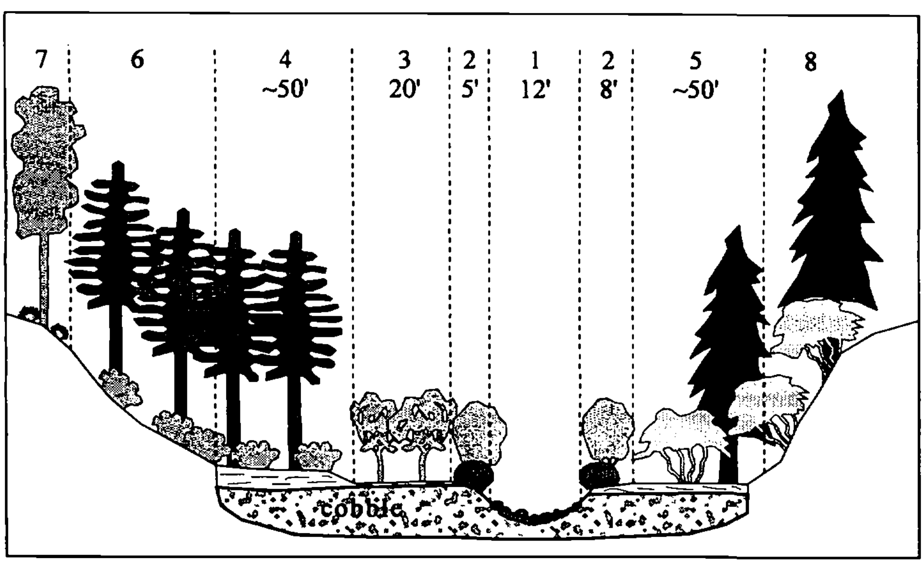


Figure 54. *Little Elk Creek, Pine RD, Wallowa-Whitman NF; mod. high gradient, mod. low elevation, V-shaped valley; Mesic Forest Zone 2.*

1 B3 stream reach
2 **Mountain alder-red-osier dogwood/mesic forb,** banks
3 **Black hawthorn** (grand fir/common snowberry-floodplain potential), 1st terrace-inactive floodplain
4 **Douglas-fir/common snowberry-floodplain,** terrace
5 **Grand fir/Rocky Mtn. maple-mallow ninebark-floodplain,** terrace
6 Douglas-fir/common snowberry, southwest-facing toeslope
7 Ponderosa pine/Idaho fescue-bluebunch wheatgrass, southwest-facing sideslope
8 Grand fir/Rocky Mtn. maple, northeast-facing sideslope

Subsurface Layer(s)	
Thickness (cm)	8-45
Texture(s)	silt loam, loam, silty clay loam gravelly loam
Coarse Fragments (%)	0-60, gravel, cobble
Roots very fine: many	fine: none to few
medium: none to few	coarse: few to common
Redoximorphic Features	some iron concentrations
Substrate	gravel, cobble, boulders

VEGETATION COMPOSITION

The black hawthorn communities that were sampled appear to be disturbance-induced seral stages of various shrub and forest plant associations. Black hawthorn forms dense thickets over shrub understories of common snowberry, alder-leaved buckthorn, or mallow ninebark. These understory shrubs may indicate the potential vegetation on the site (e.g., ALIN/SYAL, PSME/SYAL, PIPO/SYAL, PSME/PHMA). Herbaceous species include sweet-scented bedstraw, mountain sweet-cicily, woods' strawberry, western meadowrue, feathery Solomonplume, blue wildrye, and Kentucky bluegrass. The grasses often increase in cover with grazing under these stands. Black hawthorn may be a climax species in non-forested landscapes. Vegetation types adjacent to sites sampled are: terraces - grand fir/Rocky Mountain maple-floodplain; sideslopes - grand fir/Rocky Mountain maple, Douglas-fir/mallow ninebark, Douglas-fir/common snowberry and ponderosa pine associations.

Principal Species		**Con**	**Cov**
Tall Shrubs			
CRDO	Black hawthorn	100	65
SYAL	Common snowberry	78	24
AMAL	Western serviceberry	56	3
ROSA	Roses	44	1
Perennial Forbs			
GATR	Sweet-scented bedstraw	89	5
OSCH	Mountain sweet-cicily	67	1
FRVE	Woods strawberry	67	1
THOC	Western meadowrue	56	5
SMRA	Feathery Solomonplume	44	7
URDI	Stinging nettle	44	4
Perennial Grasses			
ELGL	Blue wildrye	78	3
POPR	Kentucky bluegrass	44	31
Ferns and Horsetails			
EQAR	Common horsetail	11	65

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 100 to 2301 (avg. 962) lbs/acre. Black hawthorn foliage is readily eaten by livestock when it is available (Habeck 1991). Common snowberry is browsed by deer, elk, and cattle. It is a nutritious species for cattle late in the season but probably sustains the least damage if grazed in the spring. Common snowberry reproduces mainly by rhizomes and can increase or decrease following heavy grazing depending on the season and yearly moisture conditions (Snyder 1991). Mallow ninebark is little browsed by livestock and wild ungulates (Habeck 1992b).

Although the above ground plant parts of black hawthorn are killed by even low intensity fires, some plants may survive and resprout from the root crown. Fire can be used to reduce or contain a black hawthorn population (Habeck 1991). Fires of low to moderate intensity will generally cause snowberry to sprout vigorously from its rhizomes. Severe fires may kill snowberry plants (Snyder 1991). Mallow ninebark is fire resistant and will resprout vigorously from horizontal rhizomes following fire (Habeck 1992b).

Black hawthorn is a valuable source of food and cover for wildlife. Fruits are eaten by blue and sharp-tailed grouse, mule deer, and small mammals. The dense branching in a hawthorn thicket provides good nesting for black-billed magpies and thrushes, long-eared owls, and other birds. Mice, voles, deer, and birds use hawthorn thickets for hiding and thermal cover (Habeck 1991). Snowberry provides good nesting cover for small mammals and many birds, including grouse, wild turkeys, and various songbirds. The fruits are eaten by quail, pheasant, grouse, and other animals (Snyder 1991).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

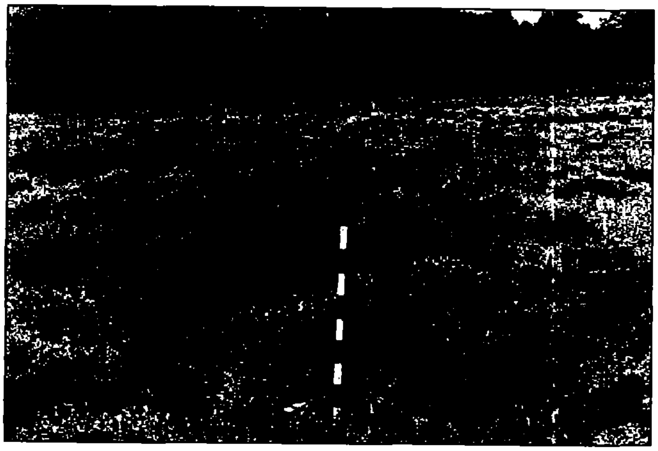
SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded to Intermittently Flooded.

OTHER STUDIES

Hansen and others (1995) described a *Crataegus succulenta* community type for Montana that includes Craetagus douglasii stands and is essentially the same community type as that described above.

Shrubby Cinquefoil/Tufted Hairgrass Plant Association

Potentilla fruticosa/Deschampsia cespitosa SW5113
POFR/DECE n=2



The physical environment is the same for these two community types (see Vegetation Composition below for explanation). These POFR community types were sampled on the Bear Valley and Prairie City RDs of the Malheur NF. Valleys with the POFR/DECE and POFR/POPR community types are wide and moderately low gradient (2%) with moderately steep side slopes. POFR communities grow on the edge of broad meadows or on stream terraces. Associated stream reach types are E4 and E6. Streams are usually 1-15 ft. 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.

Shrubby Cinquefoil/Tufted Hairgrass

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4820	–
Plot Aspect (°)	315	0
Plot Slope (%)	2	1
Valley Width (m)	350	–
Valley Gradient (%)	2	–
Valley Aspect (°)	160	0
Water Table Depth (cm)	–	–
Depth to Mottling (cm)	–	–
Soil Surface Cover (%)		
Submerged	3	4
Bare Ground	1	1
Gravel	–	–
Rock	6	9
Moss	39	51
Litter	14	2

Shrubby Cinquefoil/Kentucky Bluegrass Plant Community Type

Potentilla fruiticosa/Poa pratensis SW5114
POFR/POPR n=8

Shrubby Cinquefoil/Kentucky Bluegrass only

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, unknown marine mixed sedimentary
Water Table Depth (cm)	25-122
Total Rooting Depth (cm)	43-69
Depth to Redoximorphic Features	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

Shrubby Cinquefoil/Kentucky Bluegrass

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4879	275
Plot Aspect (°)	134	64
Plot Slope (%)	2	1
Valley Width (m)	169	147
Valley Gradient (%)	2	0
Valley Aspect (°)	94	65
Water Table Depth (cm)	81	40
Depth to Mottling (cm)	69	1
Soil Surface Cover (%)		
Submerged	–	–
Bare Ground	6	6
Gravel	1	2
Rock	1	2
Moss	1	3
Litter	63	45

VEGETATION COMPOSITION

POFR/POPR is a grazing-induced seral stage of POFR/DECE. 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 POFR/DECE 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. Upland vegetation types on adjacent sideslopes are: ponderosa pine/bitterbrush/elk sedge, Douglas-fir/elk sedge, Douglas-fir/common snowberry and other ponderosa pine and big sagebrush types.

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 800 to 1666 (avg. 1344) lbs/acre on POFR/POPR sites. No data are available for the POFR/DECE sites. Tufted hairgrass is highly palatable for cattle and sheep and moderately palatable for elk. It reproduces entirely by seed and should not be grazed much early in the growing season (Roche 1983). Overgrazing will kill tufted hairgrass, and it will be replaced by forbs and Kentucky bluegrass. Where the water table is high, it is often replaced by Baltic rush and Nebraska sedge. Shrubby cinquefoil is generally low in palatability to wild ungulates and livestock (Tirmenstein 1987). Under moderate to heavy grazing, however, shrubby cinquefoil can be heavily browsed and decrease in cover or be completely lost from the site. Kentucky bluegrass is highly palatable to livestock, elk, mule deer, and bighorn sheep (Tirmenstein 1987). It can withstand moderately high grazing pressure but can be weakened and reduced in cover by overgrazing due to its shallow root system (Kovalchik 1987).

Shrubby Cinquefoil/Tufted Hairgrass

Principal Species		Con	Cov
Shrubs			
POFR	Shrubby cinquefoil	100	18
Perennial Forbs			
POBI	American bistort	100	5
ASCA2	Aster campestris	50	10
POOC	Western polemonium	50	2
ARCH	Leafy arnica	50	2
POGR	Northwest cinquefoil	50	10
ACMI	Yarrow	–	–
FRVI	Broad-petal strawberry	–	–
ANMI	Rosy pussytoes	–	–
GABO	Northern bedstraw	–	–
SIOR	Oregon checkermallow	–	–
Perennial Grasses			
DECE	Tufted hairgrass	100	13
POPR	Kentucky bluegrass	100	10
ALPR	Meadow foxtail	50	50
POPA	Fowl bluegrass	50	15
KOCR	Prairie junegrass	–	–
Sedges and Rushes			
CANE	Nebraska sedge	100	40
JUBA	Baltic rush	100	15
CASI2	Short-beak sedge	50	25

Shrubby Cinquefoil/Kentucky Bluegrass

Principal Species		Con	Cov
Shrubs			
POFR	Shrubby cinquefoil	100	37
Perennial Forbs			
POBI	American bistort	13	5
ASCA2	Aster campestris	13	6
POOC	Western polemonium	–	–
ARCH	Leafy arnica	–	–
POGR	Northwest cinquefoil	100	32
ACMI	Yarrow	100	11
FRVI	Broad-petal strawberry	88	9
ANMI	Rosy pussytoes	75	4
GABO	Northern bedstraw	63	3
SIOR	Oregon checkermallow	50	5
Perennial Grasses			
DECE	Tufted hairgrass	13	2
POPR	Kentucky bluegrass	100	39
ALPR	Meadow foxtail	13	8
POPA	Fowl bluegrass	13	4
KOCR	Prairie junegrass	50	4
Sedges and Rushes			
CANE	Nebraska sedge	13	2
JUBA	Baltic rush	75	13
CASI2	Short-beak sedge	–	–

POFR communities probably do not burn frequently because of their relatively high moisture status. During dry years, fires may burn lightly to moderately. Effects of fire on tufted hairgrass may be similar to effects on other tufted grass species. A light fire may only burn above-ground plant parts leaving the root crown intact to resprout. A hot fire probably kills the crown leaving the site open for colonization by forbs, rhizomatous graminoids or seeds of tufted hairgrass from off-site sources. Shrubby cinquefoil can sprout from surviving root crowns or prostrate branches following fire (Tirmenstein 1987). Kentucky bluegrass is most susceptible to fire during the late spring. Cooler fires that occur when the plants are dormant or not actively producing biomass (early spring, summer, and fall) may have little effect. High soil moisture protects the rhizomes from damage.

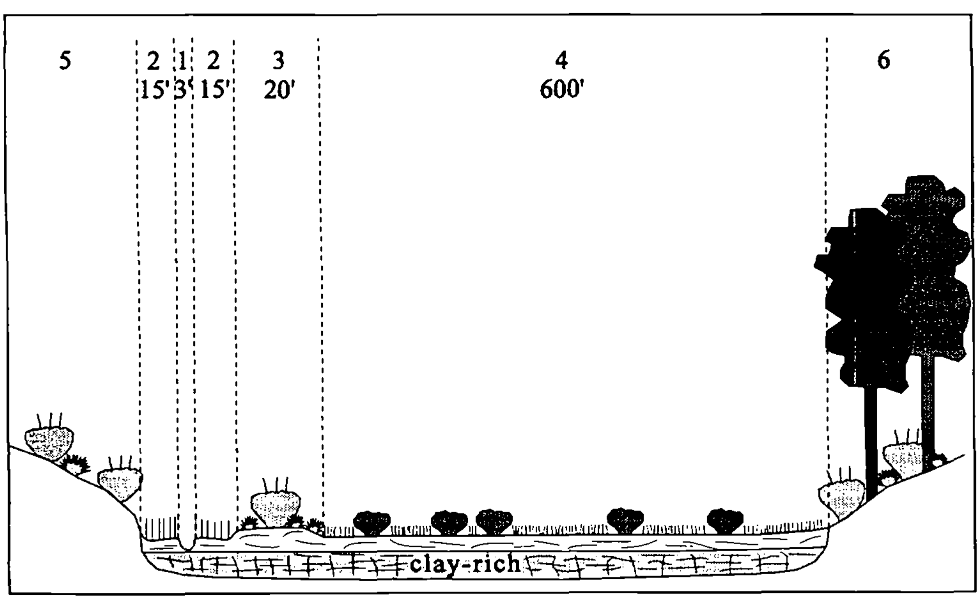
Small birds and mammals eat the seeds of shrubby cinquefoil. Dense stands can provide fair cover for antelope and mule deer and good cover for small birds and mammals (Tirmenstein 1987). Kentucky bluegrass seeds and leaves are eaten by numerous small mammals and songbirds (Uchytil 1993). Tufted hairgrass and Kentucky bluegrass-dominated sites are good habitat for mice, gophers and ground squirrels (Kovalchik 1987).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded.

OTHER STUDIES

The POFR/DECE and POFR/POPR community types and their successional relationship has been described by Padgett and others (1989) for Utah and southeastern Idaho and by Youngblood and others (1985) for eastern Idaho and western Wyoming. Hansen and others (1995) describe the POFR/DECE habitat type for Montana.



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

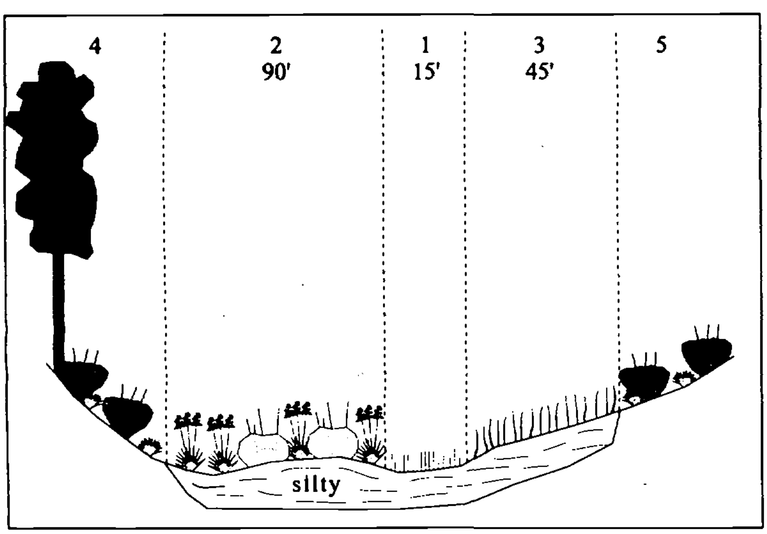
Figure 55. *Wickiup Creek, Bear Valley RD, Malheur NF; mod. gradient, mod. high elevation, trough-shaped valley; Continental Zone*

Silver Sagebrush/Tufted Hairgrass Plant Association

Artemisia cana/Deschampsia cespitosa SW6111
ARCA/DECE n=1

Silver Sagebrush/Tufted Hairgrass

Valley Environment	Mean	S.D.
Elevation (ft.)	5040	–
Plot Aspect (°)	288	–
Plot Slope (%)	2	–
Valley Width (m)	20	–
Valley Gradient (%)	1	–
Valley Aspect (°)	–	–
Water Table Depth (cm)	74	–
Depth to Mottling (cm)	51	–
Soil Surface Cover (%)		
Bare Ground	3	–
Moss	5	–
Litter	92	–



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, southwest-facing sideslope
5 Big sagebrush/Idaho fescue-bluebunch wheatgrass, northwest-facing sideslope

Figure 56. *Fuqua Creek, Burns RD, Malheur NF; very low gradient, mod., high elevation, trough-shaped valley; Continental Zone*

Silver Sagebrush/Kentucky Bluegrass Plant Community Type

Artemisia cana/Poa pratensis SW6112
ARCA/POPR n=2

PHYSICAL ENVIRONMENT

The physical environment is the same for these two community types (see Vegetation Composition below for explanation). These ARCA community types were sampled on the Bear Valley and Burns RDs of the Malheur NF. Valleys with the ARCA/DECE and ARCA/POPR community types are wide and moderately low gradient (2%) with moderately steep side slopes. ARCA communities grow on the edge of broad meadows or on stream terraces. Associated stream reach types are E or F streams, the latter occuring where the stream has been downcut. Streams are usually 1-15 ft. wide with small

Silver Sagebrush/Kentucky Bluegrass

Valley Environment	Mean	S.D.
Elevation (ft.)	5015	262
Plot Aspect (°)	355	57
Plot Slope (%)	1	0
Valley Width (m)	110	127
Valley Gradient (%)	1	1
Valley Aspect (°)	326	57
Water Table Depth (cm)	136	48
Depth to Mottling (cm)	99	76
Soil Surface Cover (%)		
Bare Ground	7	2
Moss	3	4
Litter	86	8

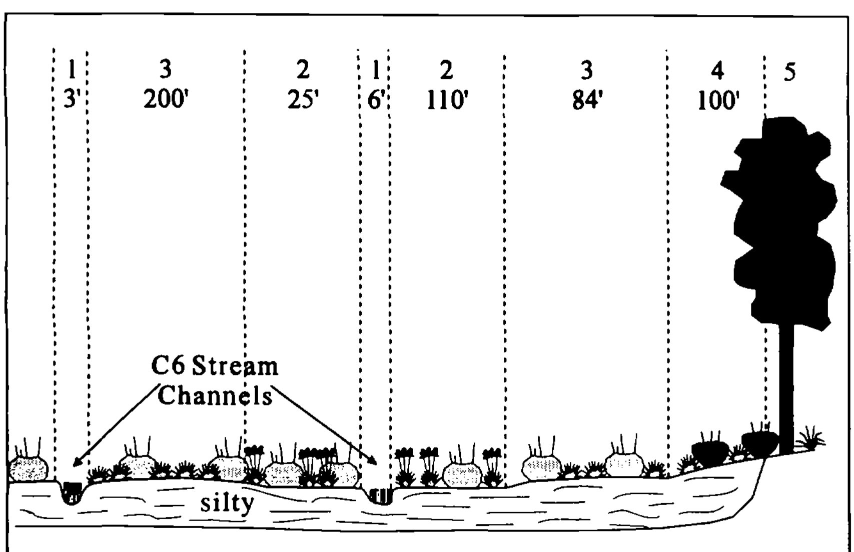
woody debris affecting less than 10% of the active channel. Soils are deep, fine-textured (clay loam, silt loam, fine sandy loam) Endoaquolls and Melanudands. Coarse fragments are absent or very deep in the profile. Sites are probably rarely flooded on the surface, but the water table is seasonally high, fluctuating from 60-100 cm below the soil surface.

VEGETATION COMPOSITION

ARCA/POPR is a grazing-induced seral stage of ARCA/DECE. 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 silver sagebrush cover ranges from 10-50%. In an undisturbed POFR/DECE 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 overgrazing, Kentucky bluegrass becomes the dominant graminoid. Upland vegetation types on adjacent sideslopes are: big sagebrush/Idaho fescue-bluebunch wheatgrass and ponderosa pine/big sagebrush/Idaho fescue-bluebunch wheatgrass.

Silver Sagebrush/Tufted Hairgrass

Principal Species		Con	Cov
Shrubs			
ARCA	Silver sagebrush	100	80
Perennial Forbs			
HOFU	Tawny horkelia	100	7
PERY	Rydberg's penstemon	100	3
SIOR	Oregon checkermallow	100	1
GEMA	Large-leaf avens	100	1
WYHE	White-headed mule's ears	100	1
POGR	Northwest cinquefoil	100	1
VAED	Tobacco-root	–	–
TAOF	Common dandelion	–	–
VIAD	Early blue violet	–	–
TRLO	Long-stalked clover	–	–
Perennial Grasses			
DECE	Tufted hairgrass	100	25
POCU	Cusick's bluegrass	100	5
POPR	Kentucky bluegrass	–	–
KOCR	Prairie junegrass	–	–
Sedges and Rushes			
JUBA	Baltic rush	100	40



1 **Baltic rush**-filled C6 stream reaches
2 **Silver sagebrush/tufted hairgrass**, floodplain-moist meadow
3 **Silver sagebrush/Cusick's bluegrass**, moist meadow
4 **Big sagebrush/Cusick's bluegrass**, dry meadow
5 Ponderosa pine/elk sedge, northeast-facing sideslope

Figure 57. *Dollar Basin, Prairie City RD, Malheur NF; very low gradient, mod.. high elevation, trough-shaped basin; Continental Zone*

Silver Sagebrush/Kentucky Bluegrass

Principal Species		Con	Cov
Shrubs			
ARCA	Silver sagebrush	100	38
Perennial Forbs			
HOFU	Tawny horkelia	50	5
PERY	Rydberg's penstemon	100	1
SIOR	Oregon checkermallow	100	1
GEMA	Large-leaf avens	–	–
WYHE	White-headed mule's ears	–	–
POGR	Northwest cinquefoil	100	20
VAED	Tobacco-root	100	5
TAOF	Common dandelion	100	1
VIAD	Early blue violet	100	1
TRLO	Long-stalked clover	100	1
Perennial Grasses			
DECE	Tufted hairgrass	–	–
POCU	Cusick's bluegrass	–	–
POPR	Kentucky bluegrass	100	45
KOCR	Prairie junegrass	100	1
Sedges and Rushes			
JUBA	Baltic rush	100	16

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass was 767 lbs/acre on the ARCA/DECE site and 1665 and 878 (avg. 1272) lbs/acre on the ARCA/POPR sites. Tufted hairgrass is highly palatable for cattle and sheep and moderately palatable for elk. It reproduces entirely by seed and should not be grazed much early in the growing season (Roche 1983). Overgrazing will kill tufted hairgrass, and it will be replaced by forbs and Kentucky bluegrass. Where the water table is high, it is often replaced by Baltic rush and Nebraska sedge. Silver sagebrush is reported to have fair to poor palatability for cattle, pronghorn, elk, and mule deer. Palatability is fair to good for sheep and upland game birds. It may increase with heavy browsing because of its rhizomatous nature (McMurray 1986). Heavy grazing and subsequent loss of associated herbaceous species allows silver sagebrush to increase in cover on the site. Kentucky bluegrass is highly palatable to livestock, elk, mule deer, and bighorn sheep (Tirmenstein 1987). It can withstand moderately high grazing pressure but can be weakened and reduced in cover by overgrazing due to its shallow root system (Kovalchik 1987).

ARCA communities probably do not burn frequently because of their relatively high moisture status. Silver sagebrush is moderately resistant to fire and can resprout from rhizomes and the root crown following fire. Seeds from offsite can also germinate in burned areas. Density of silver sagebrush before burning is usually rapidly regained and sometimes increased (McMurray 1986). Effects of fire on tufted hairgrass may be similar to effects on other tufted grass species. A light fire may only burn above-ground plant parts leaving the root crown intact to resprout. A hot fire probably kills the crown leaving the site open for colonization by forbs, rhizomatous graminoids, or seeds of tufted hairgrass from off-site sources. Kentucky bluegrass is most susceptible to fire during the late spring. Cooler fires that occur when the plants are dormant or not actively producing biomass (early spring, summer, and fall) may have little effect. High soil moisture protects the rhizomes from damage.

Silver sagebrush can produce good hiding cover for geese, rabbits, coyotes, and mule deer as well as other small mammals and songbirds because of its free branching, layering, and root sprouting (McMurray 1986). Kentucky bluegrass seeds and leaves are eaten by numerous small mammals and songbirds (Uchytil 1993). Tufted hairgrass and Kentucky bluegrass-dominated sites are good habitat for mice, gophers, and ground squirrels (Kovalchik 1987).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Scrub-Shrub, SUBCLASS Broad-leaved Deciduous, WATER REGIME (NONTIDAL) Temporarily Flooded.

OTHER STUDIES

The ARCA/DECE and ARCA/POPR community types and their successional relationship to each other have been described by Padgett and others (1989) for Utah and southeastern Idaho. Youngblood and others (1985) described an ARCA/POPR community type as seral to ARCA/FEID (Idaho fescue) for eastern Idaho and western Wyoming. For Nevada Manning and Padget (1995) describe an Artemsia cana cover type, which is similar to the ARCA/POPR community type.

Mountain Big Sagebrush/Cusick's Bluegrass Plant Association

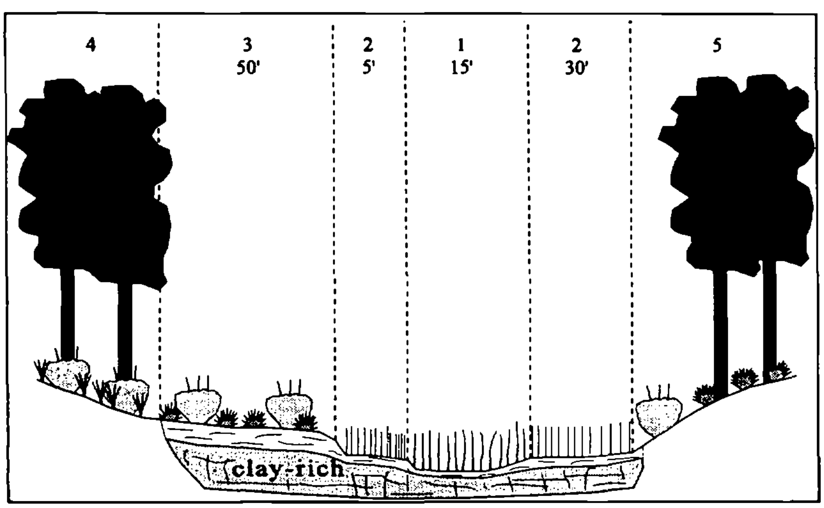
Artemisia tridentata ssp. *vaseyana/Poa cusickii* SW6113
ARTRV/POCU n=5

PHYSICAL ENVIRONMENT

The ARTRV/POCU association was sampled on the Burns and Bear Valley RDs (Malheur NF) in broad, trough, or flat-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 and F6 (the latter two occurring where E5 and E6 streams once flowed). Silt and fine sand bedloads are predominant. Streams are usually 1-30 ft. wide with essentially no woody debris affecting the channel. Soils are deep, fine-textured (silt loam, clay loam, sandy loam), coarse-fragment free Mollisols. 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	**Mean**	**S.D.**
Elevation (ft.)	5250	298
Plot Aspect (°)	42	76
Plot Slope (%)	4	3
Valley Width (m)	203	101
Valley Gradient (%)	1	1
Valley Aspect (°)	321	70
Water Table Depth (cm)	129	16
Depth to Mottling (cm)	91	–
Soil Surface Cover (%)		
Bare Ground	20	18
Litter	79	18

Soil Profile Characteristics		
Bedrock/Parent Material(s)		basalt
Water Table Depth (cm)		117-140
Total Rooting Depth (cm)		23-89
Depth to Redoximorphic Features		91
Surface Layer		
Thickness (cm)		23-64
Texture(s)		silt loam, sandy loam
Coarse Fragments (%)		0
Roots	very fine: many; medium: none to common	fine: many; coarse: none to common
Redoximorphic Features		none
Subsurface Layer(s)		
Thickness (cm)		19-62
Texture(s)		silt loam, loam, sandy loam
Coarse Fragments (%)		0-5, gravel
Roots	very fine: many; medium: none to few	fine: none to many; coarse: few
Redoximorphic Features		few iron concentrations
Substrate		clay loam, bedrock



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

Figure 58. *S. Fk. Trout Creek, Burns RD, Malheur NF; very low gradient, mod. high elevation, trough-shaped valley; Continental Zone*

VEGETATION COMPOSITION

Mountain big sagebrush forms a moderately dense to dense shrub canopy (3 ft. tall) over an herbaceous understory dominated by Cusick's bluegrass. Forbs are sparse and include yarrow, Northwest cinquefoil, rosy pussytoes, Nuttall's violet, and Oregon checkermallow. Under heavy grazing thread-leaved sedge increases and can replace Cusick's bluegrass as the dominant graminoid. Upland vegetation types adjacent to sites sampled are: terraces - low sagebrush/Sandberg's bluegrass; sideslopes - big sagebrush/ Idaho fescue-bluebunch wheatgrass, ponderosa pine/big sagebrush/Idaho fescue-bluebunch wheatgrass, ponderosa pine/ big sagebrush/elk sedge and other ponderosa pine associations.

Principal Species		**Con**	**Cov**
Shrubs			
ARTRV	Mountain big sagebrush	100	67
Perennial Forbs			
ACMI	Yarrow	80	1
POGR	Northwest cinquefoil	60	2
ANMI	Rosy pussytoes	60	2
VINU	Nuttall's violet	60	1
SIOR	Oregon checkermallow	60	1
TAOF	Common dandelion	60	1
Perennial Grasses			
POCU	Cusick's bluegrass	100	44
Sedges and Rushes			
CAFI	Thread-leaved sedge	80	20
JUBA	Baltic rush	60	2

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 433 to 1196 (avg. 698) lbs/acre. Mountain big sagebrush is reported to have poor to good palatability to livestock, elk, mule deer, and pronghorn. During the winter it can be an important browse species. The cover value of this species is fair to good for pronghorn, mule deer, bighorn sheep, and elk (Bradley 1986a). Cattle prefer Cusick's bluegrass to Sandberg bluegrass and bluebunch wheatgrass. Cusick's bluegrass is highly palatable to sheep, horses, elk, and mule deer. Its palatability for pronghorn is fair. Moderate to intense grazing can be very detrimental to Cusick's bluegrass (Bradley 1986b). Threadleaf sedge is palatable throughout the growing season and provides excellent forage for livestock and wild ungulates, including cattle, sheep, horses, elk, mule deer, and pronghorn. Vegetative production is low and threadleaf sedge decreases under heavy grazing pressure. Plants must be allowed to develop seed (the primary means of reproduction) and thus cannot be closely grazed every year (Walkup 1991b.)

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).

Mountain big sagebrush provides fair cover for small mammals and birds and good cover for upland game birds (Bradley 1986a). Because of their short stature (3-10 in.) Cusick's bluegrass and threadleaf sedge provide cover for only very small mammals and birds (Bradley 1986b, Walkup 1991b).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

This plant association cannot be denoted as a wetland under this classification.

OTHER STUDIES

Kovalchik (1987) described an ARTEM/POCU Association for central Oregon. Artemisia tridentata and A. cana were combined in this association.

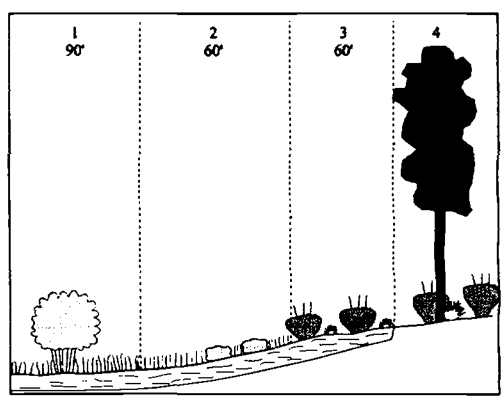


Figure 59.
Crooked Creek Meadows, Bear Valley RD, Malheur NF; very low gradient, mod. high elevation, trough-shaped basin; Continental Zone

1 Willow/sedge, wet meadow
2 **Shrubby cinquefoil/Kentucky bluegrass,** moist meadow
3 **Big sagebrush/Cusick's bluegrass,** dry meadow
4 Ponderosa pine/big sagebrush/Idaho fescue-bluebunch wheatgrass, east-facing toeslope

Miscellaneous
Currants, Pacific Yew, Red-Osier dogwood, Water Birch, Western Serviceberry, Alder-Leaved Buckthorn and Sagebrush Types

Currants/Tall Mannagrass Plant Community Type

Ribes ssp./*Glyceria elata*
RIBES/GLEL n=3

The RIBES/GLEL community type was sampled on Long Creek and Prairie City RDs (Malheur NF) and Baker RD (Wallowa-Whitman NF) from 4950 to 6340 ft. in elevation. It probably occurs in low abundance over much of the central Blue Mountains. This community type may be occasionally seral to ALIN/GLEL, as indicated by the presence of scattered and successfully reproducing mountain alder through the community. At higher elevations, especially on a very steep, very narrow stream, it is probably the latest seral stage that will occur on the fluvial surface. Prickly (RILA) and stinking (RIHU) currants form a scattered to dense canopy over tall mannagrass (GLEL) and a variety of mesic forbs, including common willow-weed (EPGL2), brook saxifrage (SAAR4), enchanter's nightshade (CIAL), and baneberry (ACRU). Adjacent sideslope vegetation types were: grand fir/twinflower, lodgepole pine (grand fir)/big huckleberry-twinflower, and subalpine fir associations. Fluvial surfaces are floodplains and stream banks. Valleys in which RIBES/GLEL was sampled were very narrow and V- or trough-shaped with very high gradients and gentle to moderately steep side slopes. Streams were A3, A4 and B3 Rosgen types, 1-15 ft. wide with 10-50% of the active stream channel affected by woody debris. The soils are Typic Endoaquents that consist of a shallow (20-30 cm), fine-textured mineral deposits over the gravel and cobbles of the buried stream bed.

Currants/Mesic Forb Plant Community Type

Ribes ssp./*Mesic Forb*
RIBES/MESIC FORB n=4

The RIBES/MESIC FORB community type was sampled on Baker, La Grande, and Wallowa Valley RDs (Wallowa-Whitman NF) from 4340 to 4780 ft. in elevation. It probably occurs in low abundance over much of the central Blue Mountains. This community type may be occasionally seral to ALIN-RIBES/MESIC FORB, as indicated by the presence of scattered and successfully reproducing mountain alder (ALIN) through the community. Prickly (RILA), stinking (RIHU), Wenaha (RIWO) and/or Idaho (RIIR) currants form a scattered to dense canopy over a variety of mesic forbs, including arrowleaf groundsel (SETR), large-leaf avens (GEMA), sweet-scented bedstraw (GATR), western meadowrue (THOC), common cowparsnip (HELA), Rocky Mountain grass-of-parnassus (PAFI), asters (ASTER), Columbia monkshood (ACCO), and wood buttercup (RAUN2). Vegetation types adjacent to sites sampled were: terraces - subalpine fir/grouse huckleberry; sideslopes - grand fir/twinflower, grand fir/elk sedge (upper slopes) and subalpine fir associations. Fluvial surfaces are floodplains, stream banks, and gravel bars. Valleys in which RIBES/MESIC FORB was sampled were narrow to wide and V-, trough-, or flat-shaped with moderate gradients (2-5%) and moderately steep side slopes. Streams were 1-15 ft. wide A4, A5, C3, and C4 Rosgen types with 10-50% of the active stream channel affected by woody debris. The soils are Endoaquents that consist of a shallow (occasionally deep), fine-textured deposit over the gravel and cobbles of the buried stream bed.

Water Birch/Mesic Forb Plant Community Type

Betula occidentalis/Mesic Forb
BEOC/MESIC FORB n=3

Three sites were sampled on Long Creek RD (Malheur NF) and Pine and Wallowa Valley RDs (Wallowa-Whitman NF). Further sampling of the canyonlands of the Snake and Imnaha Rivers may produce more examples of this community type. The fluvial surfaces were streambanks, a terrace, and an overflow channel. Water birch (BEOC) forms a moderately dense shrub canopy over a shrub understory that can consist of stinking currant (RIHU), Lewis' mock-orange (PHLE2), Idaho currant (RIIR), mountain alder ALIN), black hawthorn (CRDO), and snowberry (SYAL). Herbaceous species include showy aster (ASCO), stinging nettle (URDI), feathery Solomonplume (SMRA), creeping bentgrass (AGST), blue wildrye (ELGL), and Kentucky bluegrass (POPR). Adjacent vegetation types were: terraces - grand fir/queen's cup beadlily; sideslopes - Douglas-fir/common snowberry and bluebunch wheatgrass-Idaho fescue. Most of these sites have been heavily disturbed by livestock grazing and may have far more Kentucky bluegrass or creeping bentgrass cover than forb cover. Rosgen stream types are B4, C3, and F4 and streams are 3-40 ft. wide with woody debris affecting 5-30% of the stream channel. Soils are Mollisols.

Water Birch/Wet Sedge Plant Community Type

Betula occidentalis/Carex spp.
BEOC/CAREX n=2

Two sites were sampled in this community type: one on Long Creek RD (Malheur NF) and one on Unity RD (Wallowa-Whitman NF). Both sites were springs with year-round water flow. Water birch (BEOC) forms a scattered canopy with various understory shrubs including stinking currant (RIHU), red-osier dogwood (COST), mountain alder (ALIN), and willows (SALIX). On one site big-leaved sedge (CAAM) is the dominant herbaceous species. On the other site Cusick's sedge (CACU2), Sitka sedge (CASI3), and bladder sedge (CAUT) dominate the herbaceous layer. Other species include common monkey-flower (MIGU), musk monkey-flower (MIMO), sharptooth angelica (ANAR2), American speedwell (VEAM), and aquatic sedge (CAAQ). Soils are organic or organic-rich mineral material.

Alder-leaved Buckthorn/Mesic Forb Community

Rhamnus alnifolia/Mesic Forb
RHAL2/MESIC FORB n=1

One example of this community was sampled along Jarboe Creek on the Walla Walla RD (Umatilla NF) at 4100 ft. elevation. Alder-leaved buckthorn (RHAL2) forms a very dense canopy over a scattering of understory shrubs and herbs, including common snowberry (SYAL), stinking currant (RIHU), common cowparsnip (HELA), sweet-scented bedstraw (GATR), western meadowrue (THOC), western coneflower (RUOC), and stinging nettle (URDI). The site sampled is a terrace in a wide, 2% gradient valley adjacent to an F6 Rosgen stream type. The soil is an Endoaquoll with a seasonally high water table.

Red-osier Dogwood/Brook Saxifrage Plant Community Type

Cornus stolonifera/Saxifraga arguta
COST/SAAR4 n=2

COST/SAAR4 is a miscellaneous community type that occurs on some of the broad seep slopes throughout the Blue and Wallowa Mountains. Seep slopes have a variety of different community types and are not necessarily part of the COST/SAAR4 community type. It was sampled on Prairie City (Malheur NF) and Pomeroy RD (Umatilla NF) at 5120 and 3670 ft. in elevation. Red-osier dogwood (COST) forms a scattered shrub layer over a dense carpet of brook saxifrage (SAAR4). Prickly (RILA) and stinking (RIHU) currant and various mesic forbs, ferns, and graminoids are present in variable amounts. Herbaceous species may include common willow-herb (EPGL2), sweet-scented bedstraw (GATR), common monkey-flower (MIGU), side-flowered mitrewort (MIST2), baneberry (ACRU), cool-wort foam-flower (TITRU), maidenhair fern (ADPE), ladyfern (ATFI), tall mannagrass (GLEL), and nodding fescue (FESU). Adjacent vegetation types were: grand fir and subalpine fir/twinflower. 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.

Western Serviceberry Plant Community Type

Amalanchier alnifolia
AMAL n=2

The western serviceberry community type has only been sampled in two locations but may occur frequently in the drier climatic zones of the Blue Mountains and Wallowa-Snake Province. It was sampled on a floodplain and at a small spring surrounded by Idaho fescue grasslands. Western serviceberry (AMAL), Rocky Mountain maple (ACGL), and occasionally, common chokecherry (PRCI) form a dense shrub overstory. The shrub understory consists of birch-leaf spirea (SPBE), thimbleberry (RUPA), mallow ninebark (PHMA), roses (ROSA), and/or creeping Oregon-grape (BERE). Herbaceous species include western sweet-cicily (OSCH), western meadowrue (THOC), showy aster (ASCO), woods strawberry (FRVE), nettle-leaf horsemint (AGUR), pinegrass (CARU), and elk sedge (CAGE). Adjacent upland vegetation were ponderosa pine and Douglas-fir associations. Soils consist of a shallow (7-38 cm) fine deposit over rocky subsoil.

Silver Sagebrush/Cusick's Bluegrass Plant Community Type

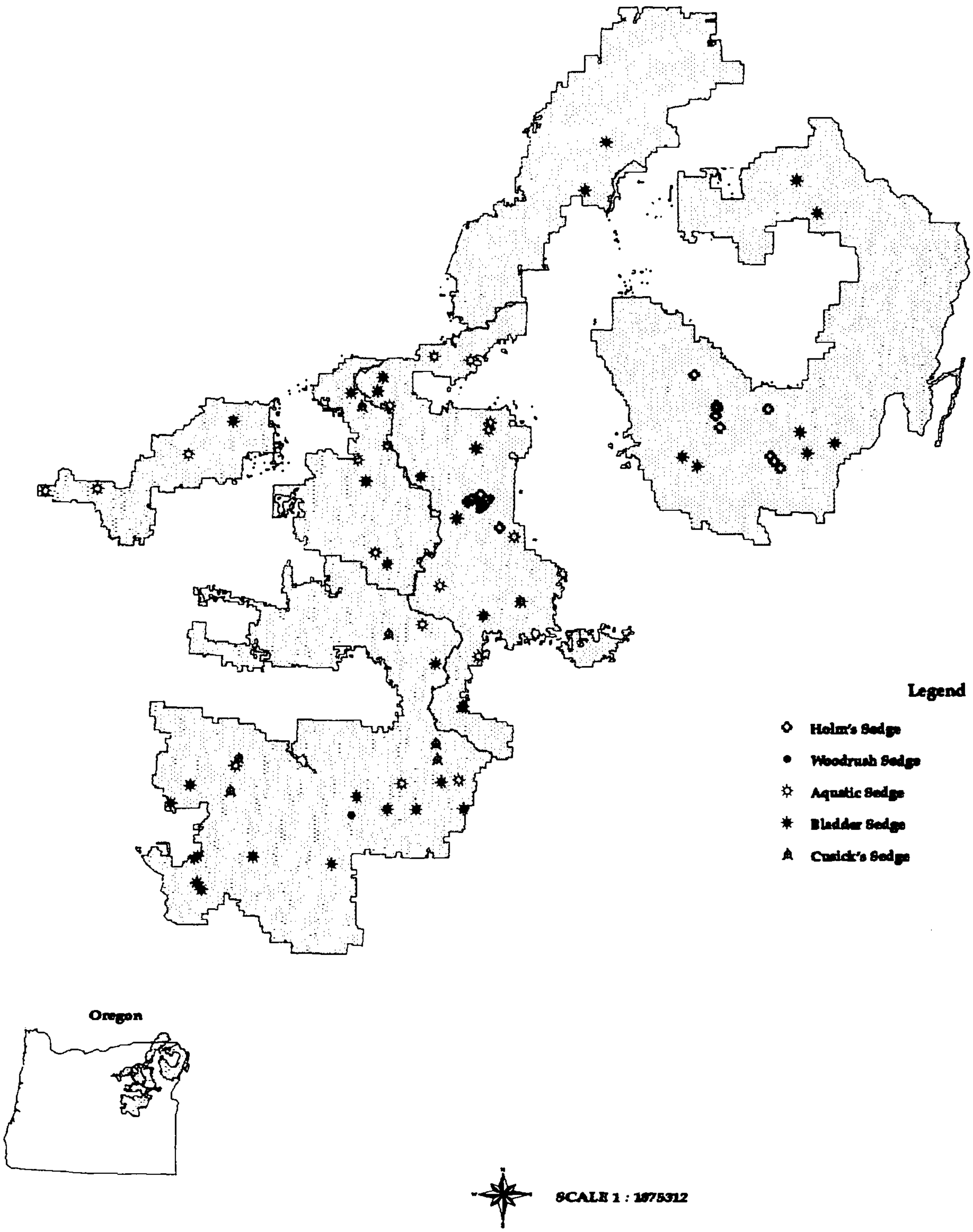
Artemisia cana/Poa cusickii
ARCA/POCU n=2

ARCA/POCU was sampled on the Burns and Prairie City RDs (Malheur NF). Sites have higher water tables than ARTRV/POCU and often occur in a lower topographic position adjacent to ARTRV/POCU or another mountain big sagebrush association. ARCA/POCU plots were at moderately high elevations (5100-5470 ft.) in very broad, low gradient valleys. Soils are deep Haploborolls or Argiborolls with silt loam, clay loam, or fine sandy loam textures and are lacking in coarse fragments. The water table is probably within the silver sagebrush rooting zone early in the growing season but drops to 60+ cm by late spring. Silver sagebrush (ARCA) forms a scattered shrub layer (2-3 ft tall) with an herbaceous layer of Cusick's bluegrass (POCU) and a variety of forbs including Northwest cinquefoil (POGR), Rydberg's penstemon (PERY), yarrow (ACMI), and aster (ASTER). Adjacent sideslope vegetation types were: big sagebrush/Idaho fescue-bluebunch wheatgrass, ponderosa pine/elk sedge and western juniper/big sagebrush. Kovalchik's ARTEM/POCU Association (1987) for central Oregon includes ARCA/POCU sites.

Figures 60, 61, 62. Following three pages
Sample site for herbaceous meadow types. This map does not represent the actual distribution of these herbaceous types.

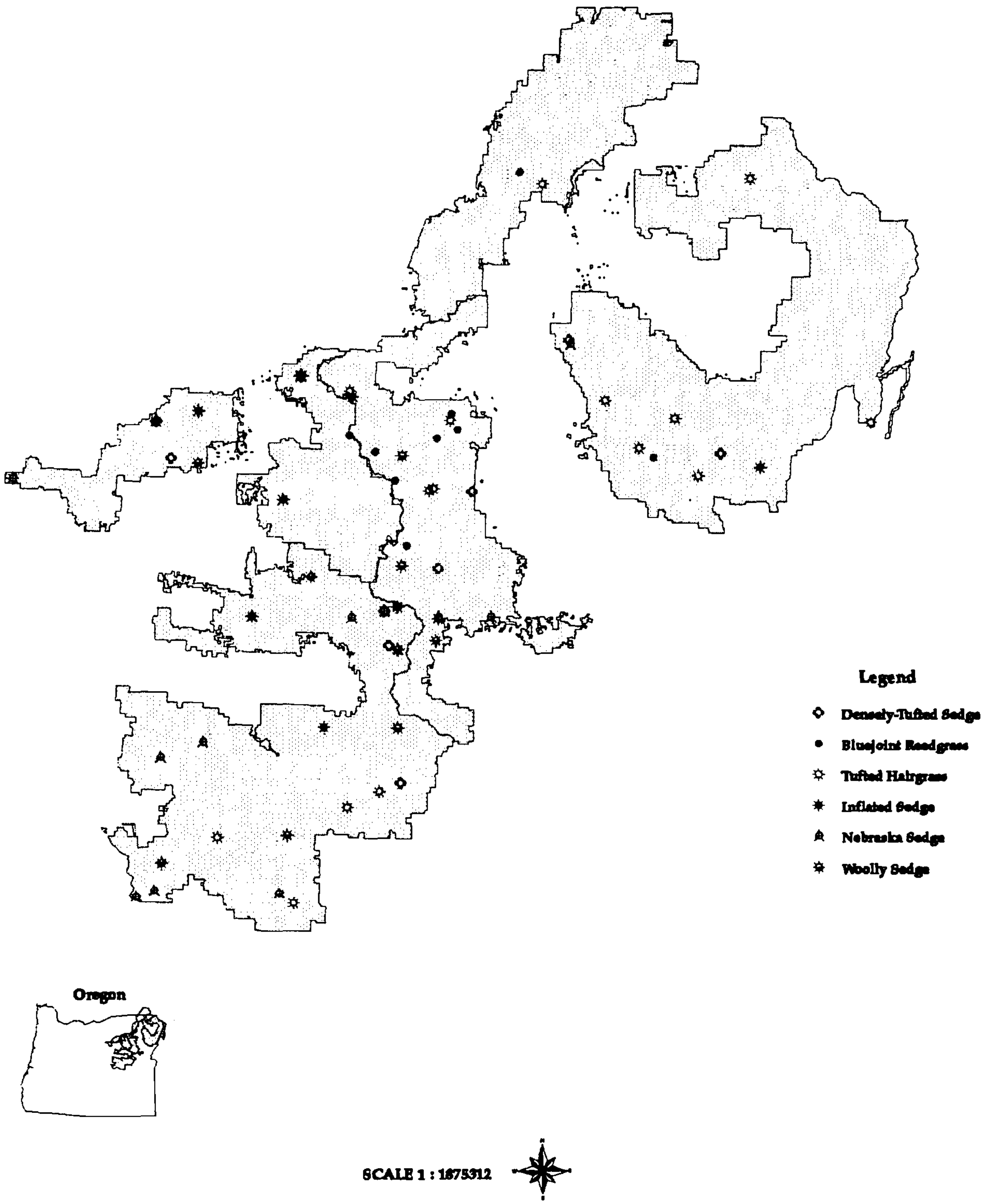
Herbaceous Plant Associations

Meadows



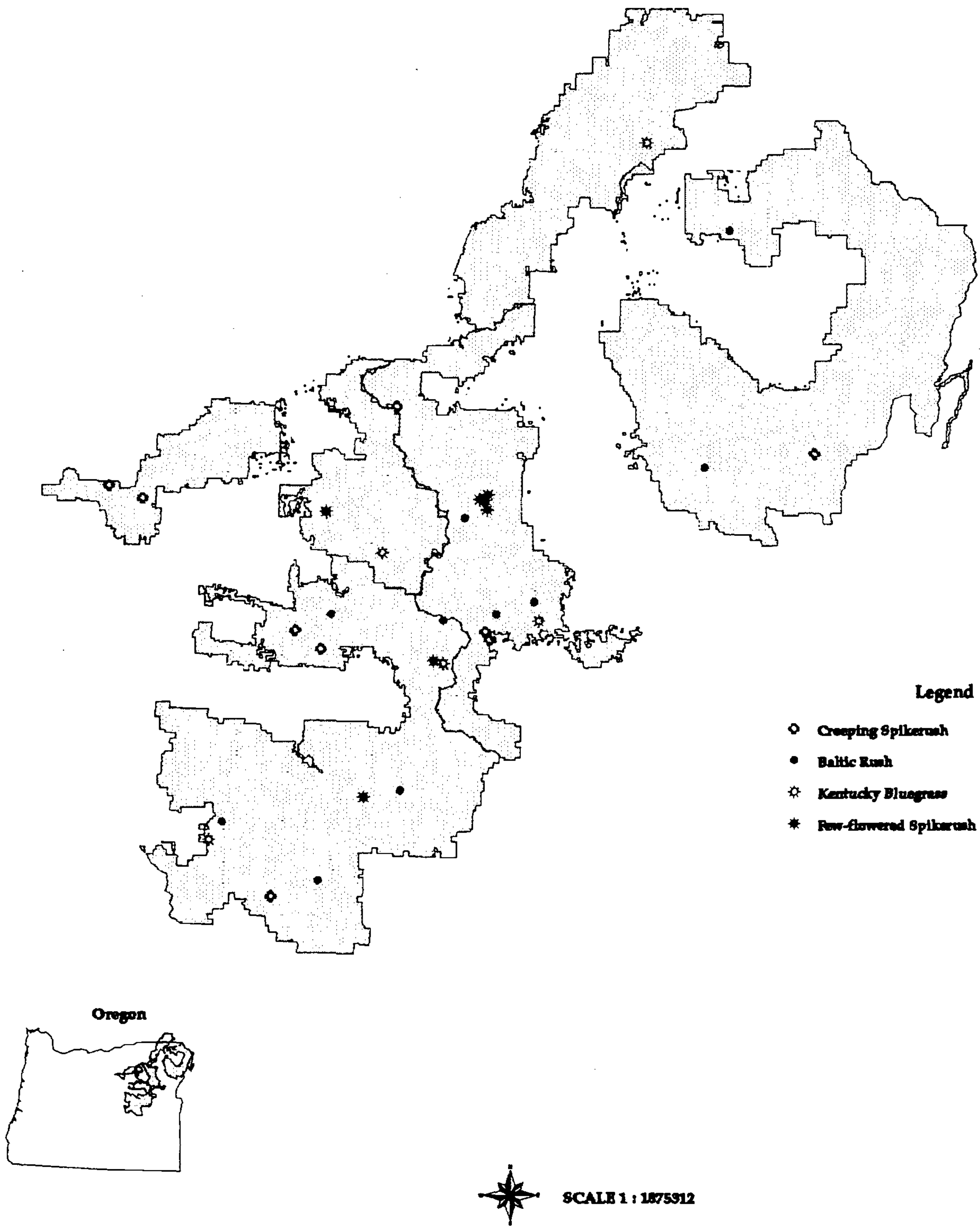
Herbaceous Plant Associations

Meadows



Herbaceous Plant Associations

Meadows



Holm's Sedge Plant Association

Carex scopulorum MS3111
CASC5 n=16

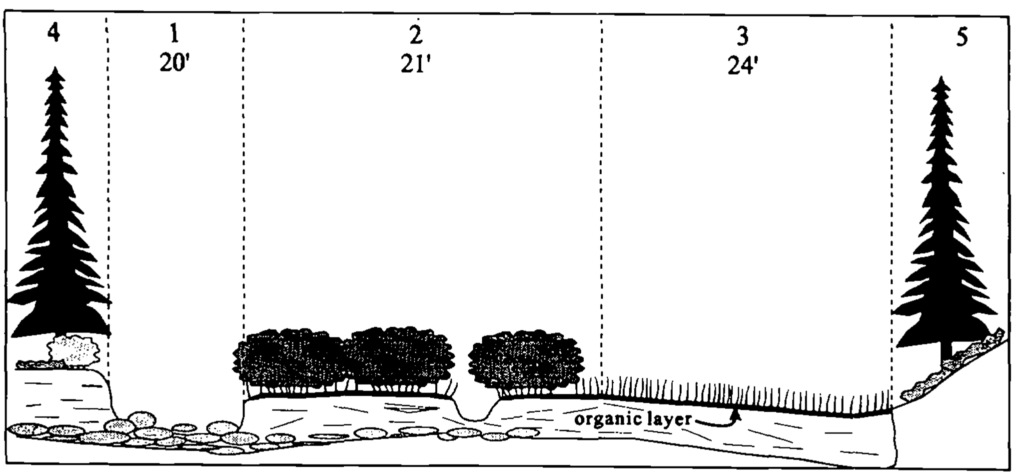
PHYSICAL ENVIRONMENT

The CASC5 association occurs at high elevations (6700-7800 ft.) in the Blue, and Wallowa Mountains. Sites were sampled on Pine, Baker, and Eagle Cap RDs (Wallowa-Whitman NF). This association has also been seen on Prairie City RD (Malheur NF). It occurs in headwater basins in narrow to wide, low gradient, trough-, U- and V-shaped valleys with gentle to steep side slopes. Where streams are present in the valley, they are E5, E6 and occasionally B3 and B4 stream reach types (1-5 ft. wide). Soils 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. Sites are often flooded during spring runoff, and the water table remains within 50 cm of the soil surface late in the growing season.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	7130	275
Plot Aspect (°)	358	69
Plot Slope (%)	2	4
Valley Width (m)	63	70
Valley Gradient (%)	2	1
Valley Aspect (°)	16	56
Soil Surface Cover (%)		
Submerged	6	12
Bare Ground	5	6
Rock	1	2
Moss	29	32
Liverwort	1	3
Litter	38	35

Soil Profile Characteristics

Bedrock/Parent Material(s)	quartz diorite, diorite,glacial moraines, igneous intrusives
Water Table Depth (cm)	0-53
Total Rooting Depth (cm)	25-117
Depth to Redoximorphic Features (cm)	8-102
Surface Layer	
Thickness (cm)	5-70
Texture(s)	sapric, hemic, fibric organic, silt loam, organic loam
Coarse Fragments (%)	0
Roots very fine: many; medium: none to many	fine: common to many; coarse: none to few
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	16-81
Texture(s)	hemic, fibric organic, organic loam, silt loam fine to coarse sandy loam
Coarse Fragments (%)	0-5, gravel
Roots very fine: many; medium: none to many	fine: few to many; coarse: none to few
Redoximorphic Features	common iron oxidation
Substrate	organics, sandy loam, sand



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

Figure 63. *East Lostine River, Eagle Cap RD, Wallowa-Whitman NF; mod. gradient, high elevation, U-shaped valley; Mesic Forest Zone 2.*

VEGETATION COMPOSITION

Holm's sedge usually forms a dense herbaceous cover unless the site is disturbed by grazing animals. Graminoids and forbs, including alpine meadow butterweed, alpine shooting star, fan-leaf cinquefoil, swamp onion, American bistort, violets, slender muhly, tufted hairgrass, and alpine timothy, are scattered through the site. Sideslope vegetation types adjacent to sites sampled are: subalpine fir/grouse huckleberry, subalpine fir/Labrador tea, subalpine fir-Engelmann spruce and other subalpine fir associations.

Principal Species		**Con**	**Cov**
Sedges and Rushes			
CASC5	Holm's sedge	100	60
Perennial Grasses			
DECE	Tufted hairgrass	69	12
Perennial Forbs			
SECY	Alpine meadow butterweed	63	8
DOAL	Alpine shooting star	56	12
POBI	American bistort	31	8
ALVA	Swamp onion	25	39
POFL	Fan-leaved cinquefoil	25	3

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 733 to 3377 (avg. 2092) lbs/acre. Holm's sedge has fair palatability for livestock and wild ungulates. Heavy grazing will result in an increase in forb cover and eventually bare soil will appear. The sod-like growth form of Holm's sedge makes it very effective for erosion control and bank stabilization.

Fires probably do not burn frequently in this wet association. Low and moderate intensity fires will not kill Holm's sedge or reduce its dominance of sites.

Meadows where the Holm's sedge association is found are good summer habitat for elk. Streams in these meadows are excellent fish habitat.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

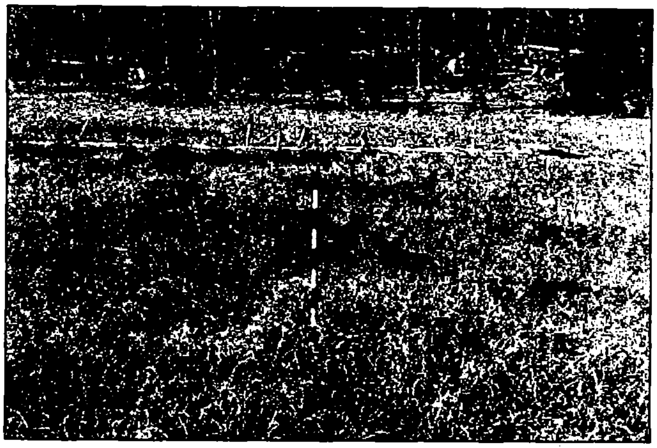
SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Seasonally Flooded to Saturated.

OTHER STUDIES

The CASC5 association has been described for central Oregon and eastern Washington by Kovalchik (1987 and 1992). Cole (1982) described the wetter parts of subalpine meadows in the Wallowa Mountains as being dominated by Holm's sedge. Manning and Padget (1995) described a *Carex scopulorum* cover type for Nevada, and Hansen and others (1995) described a *Carex scopulorum* habitat type for Montana.

Wood-rush Sedge Plant Association

Carex luzulina MM2916
CALU n=7



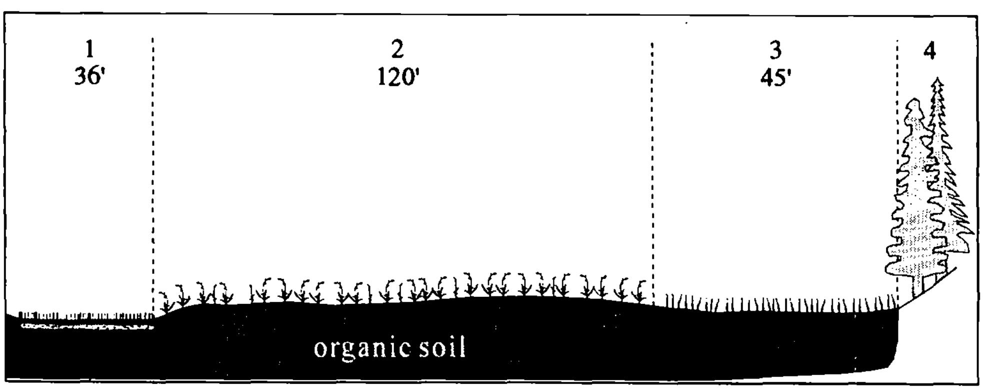
PHYSICAL ENVIRONMENT

The CALU association was sampled at high elevations (5030-7020 ft.) in the Blue Mountains (North Fork John Day RD, Umatilla NF; Baker RD, Wallowa-Whitman NF; Burns RD, Malheur NF). It also occurs in the high Wallowa Mountains. Valleys are moderately wide, low gradient, and trough-shaped with gentle side slopes. Sites are headwater basins and occasionally floodplains. The only associated stream was a narrow (less than 5 ft.) E6 stream reach type with no organic debris affecting the channel. Soils are Endoaquolls (Typic and Histic) and a Borohemist. Soil textures are silty clay, silt loam, and loam. The soils are deep and have high water-holding capacities.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	6241	988
Plot Aspect (°)	100	66
Plot Slope (%)	3	3
Valley Width (m)	43	25
Valley Gradient (%)	1	1
Valley Aspect (°)	93	63
Soil Surface Cover (%)		
Submerged	5	7
Bare Ground	3	4
Moss	54	40
Litter	13	16

Soil Profile Characteristics

Bedrock/Parent Material(s)		diorite, rhyolite, andesite, basalt, moraines
Water Table Depth (cm)		30-110
Total Rooting Depth (cm)		10-45
Depth to Redoximorphic Features		0-25
Surface Layer		
Thickness (cm)		2-106
Texture(s)		hemic, fibric organic, silt loam
Coarse Fragments (%)		0
Roots	very fine: many	fine: few to many
	medium: none	coarse: none
Redoximorphic Features		none
Subsurface Layer(s)		
Thickness (cm)		35-100
Texture(s)		hemic organic, silt loam loam, sandy clay
Coarse Fragments (%)		0
Roots	very fine: none to many	fine: none to many
	medium: none to few	coarse: none
Redoximorphic Features		common iron oxidation
Substrate		organics, sandy loam, sand



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

Figure 64. *Headwater Basin of Grande Ronde River, La Grande RD, Wallowa-Whitman NF; mod.. low gradient, high elevation, trough-shaped valley; Mesic Forest Zone 1.*

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, nodding chickweed, Jeffrey's shooting star, alpine shooting star, alpine meadow butterweed, white bog-orchid, and long-stalked clover. Moss cover is generally very high. Adjacent sideslope vegetation types are: subalpine fir/grouse huckleberry, lodgepole pine/pinegrass, lodgepole pine (subalpine fir)/grouse huckleberry, grand fir/pine grass and other subalpine associations.

Principal Species		Con	Cov
Sedges and Rushes			
CALU	Wood-rush sedge	100	47
CAAQ	Aquatic sedge	71	24
ELPA2	Few-flowered spike-rush	71	4
CAJO	Jones' sedge	71	8
LUCAM	Field woodrush	71	7
Perennial Grasses			
DECE	Tufted hairgrass	100	9
MUFI	Slender muhly	71	26
PHAL	Alpine timothy	71	4
Perennial Forbs			
HYAN	Bog St. John's wort	71	20
SECY	Alpine meadow butterweed	71	4
DOAL	Alpine shooting star	57	14
DOJE	Jeffrey's shooting star	57	13
CENU	Nodding chickweed	57	1
HADI2	White bog-orchid	57	tr

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 1014 to 1100 (avg. 1057) lbs/acre.The sites sampled were usually not in a livestock grazing allotment but showed signs of elk grazing. Heavy grazing of sites causes an increase in forb and slender muhly cover.

Effects of fire on this plant association are unknown.

SDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

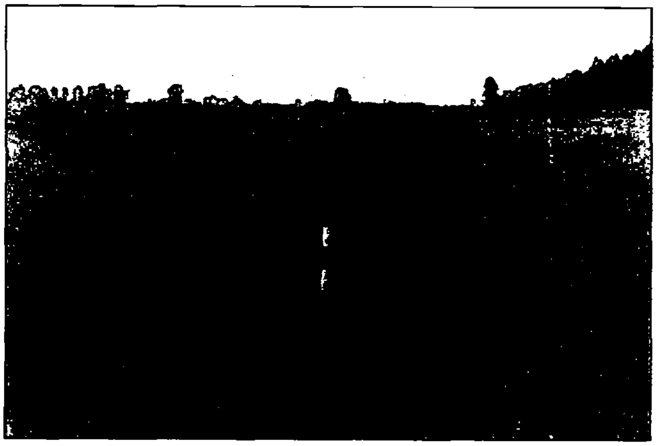
SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Seasonally Flooded to Saturated.

OTHER STUDIES

The CALU association has not been previously described.

Aquatic Sedge Plant Association

Carex aquatilis MM2914
CAAQ n=33



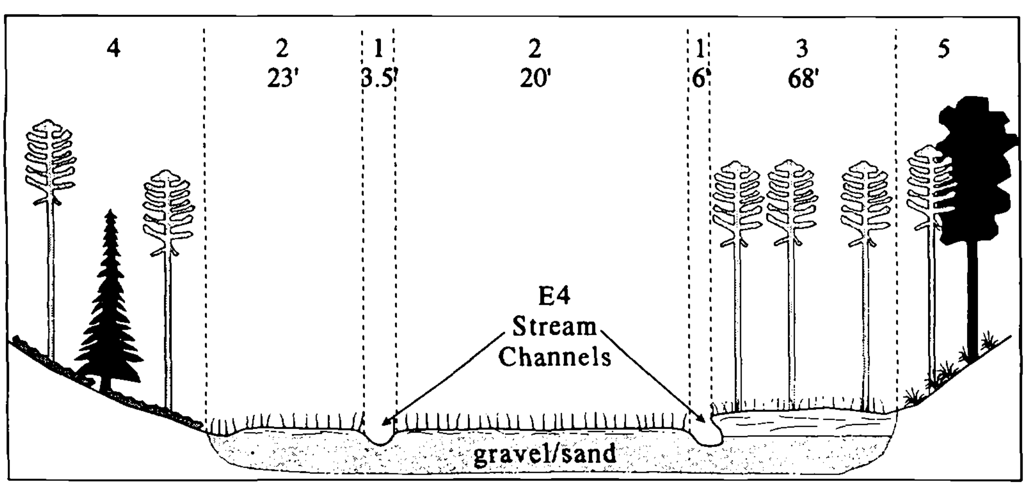
PHYSICAL ENVIRONMENT

The CAAQ association occurs throughout the Blue and Wallowa 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 Baker, Unity, and La Grande RDs (Wallowa-Whitman NF). It is found at moderate to high elevations (3060 to 7470 ft.) in 65-1000 ft. wide, low gradient, trough- and V-shaped valleys (sometimes in U- or flat-shaped) with gentle to moderately steep side slopes. Sites are wet basins (fens), floodplains, and occasionally springs and lake edges. Where streams are present in the valley, they are C3, C4, C5, E4, E5 and E6 stream types. Stream widths are 1-30 ft. wide (most are 1-5 ft. wide). Woody debris is usually absent but can be present in as much as 30% of the active channel. Soils are organic (Borosaprists, Borohemists, and Borofibrists) or mineral (Endoaquolls, Fluvaquents, and Endoaquents). Mineral soils are fine-textured and have high water holding capacity. The soils are saturated to the surface well into the summer, and the water table is usually within 50 cm of the soil surface late in the growing season. The CAAQ association occurs on somewhat drier sites than the CAUT association. Permanent flooding of a CAAQ site by a beaver dam or other obstruction may change the site potential to CAUT.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4961	800
Plot Aspect (°)	80	69
Plot Slope (%)	2	2
Valley Width (m)	133	103
Valley Gradient (%)	2	1
Valley Aspect (°)	68	69
Soil Surface Cover (%)		
Submerged	11	21
Bare Ground	10	21
Moss	11	22
Liverwort	2	9
Litter	38	38

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, rhyolite, andesite gabbro, moraines, igneous intrusive, mixed alluvium
Water Table Depth (cm)	0-102
Total Rooting Depth (cm)	23-127
Depth to Redoximorphic Features (cm)	8-76



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

Figure 65. *Summit Creek, Prairie City RD, Malheur NF; very low gradient, mod. high elevation, flat-shaped valley; Continental Zone*

Surface Layer

Thickness (cm)	8-69
Texture(s)	sapric, hemic, fibric organic, silt loam, loam, fine sandy loam
Coarse Fragments (%)	0-70, gravel
Roots	very fine: many; fine: common to many; medium: none to common; coarse: few
Redoximorphic Features	some iron oxidation

Subsurface Layer(s)

Thickness (cm)	15-100
Texture(s)	hemic, sapric organic, silt loam fine sandy loam, clay loam
Coarse Fragments (%)	0-50, gravel
Roots	very fine: few to many; fine: few to many; medium: none to common; coarse: none to common
Redoximorphic Features	common iron oxidation

Substrate gravel, sand, clay

VEGETATION COMPOSITION

Aquatic sedge has at least 25% cover or is the dominant graminoid. It usually forms a dense herbaceous overstory with a variety of understory herbs scattered through the stand including large-leaf avens, common willow-herb, western polemonium, musk monkey-flower, and bog St. John's wort. Commonly found graminoids are Baltic rush, small-fruit bulrush, field woodrush, tufted hairgrass, and tall mannagrass. Presence of scattered willows may indicate a willow/sedge association potential on the site. A site on which the aquatic sedge has formed an extremely dense network of rhizomes 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-long saturation may exclude willow establishment because some willow species cannot tolerate prolonged submersion of their root crowns (Esser 1992, Tesky 1992). Vegetation types adjacent to sites sampled are: terraces - ponderosa pine-Douglas fir, lodgepole pine/Kentucky bluegrass; sideslopes - grand fir-Engelmann spruce-lodgepole pine communities and grand fir associations.

Principal Species		**Con**	**Cov**
Sedges and Rushes			
CAAQ	Aquatic sedge	97	68
JUBA	Baltic rush	36	7
SCMI	Small-fruit bulrush	33	12
CASI3	Sitka sedge	3	70
Perennial Grasses			
DECE	Tufted hairgrass	42	21
Perennial Forbs			
GEMA	Large-leaf avens	48	3
EPGL2	Common willow-herb	48	3
POOC	Western polemonium	33	7
MIMO	Musk monkey-flower	33	3

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 100 to 5333 (avg. 2786) lbs/acre. Aquatic sedge may be grazed by livestock late in the season when the soils are drier. Its deep rhizomes make it moderately resistant to grazing if trampling does not occur when the soils are wet. Wild ungulates will also graze aquatic sedge, but it is not a major component of their diet (Cope 1992b).

On CAAQ sites that are heavily grazed, the aquatic sedge generally decreases and is replaced by forbs, Baltic rush, Nebraska sedge, and ultimately Kentucky bluegrass. The bluegrass will usually only become dominant if the stream has been downcut and the water table lowered.

Aquatic sedge reproduces mainly by deep-seated rhizomes and thus is well-suited to survive low to moderate intensity fires. Hot fires on a dry substrate can burn up the organic layers and kill the rhizomes. Aquatic sedge can colonize burned areas by seeds and with the spread of its rhizomes (Cope 1992b).

Aquatic sedge provides cover and/or forage for small mammals, water fowl, and other birds including sandhill cranes, green-winged teals, common snipes, common yellowthroat, and red-winged blackbirds.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

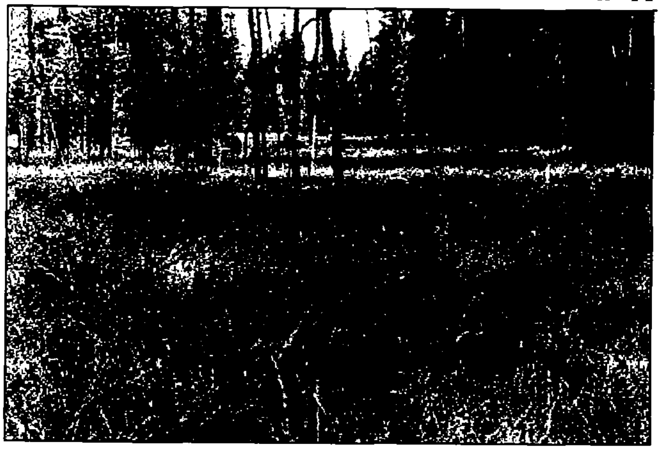
SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Seasonally Flooded to Saturated.

OTHER STUDIES

The CAAQ association has been described for central Oregon and eastern Washington (Kovalchik 1987 and 1992), for the southern Malheur National Forest (Padgett 1981), for Montana (Hansen and others 1995), for Nevada (Manning and Padgett 1995) and for Utah, southeastern Idaho and western Wyoming (Padgett and others 1989, Youngblood and others 1985). It has been described as a plant association, a cover type, and a community type.

Cusick's Sedge Plant Association

Carex cusickii MM2918
CACU2 n=11



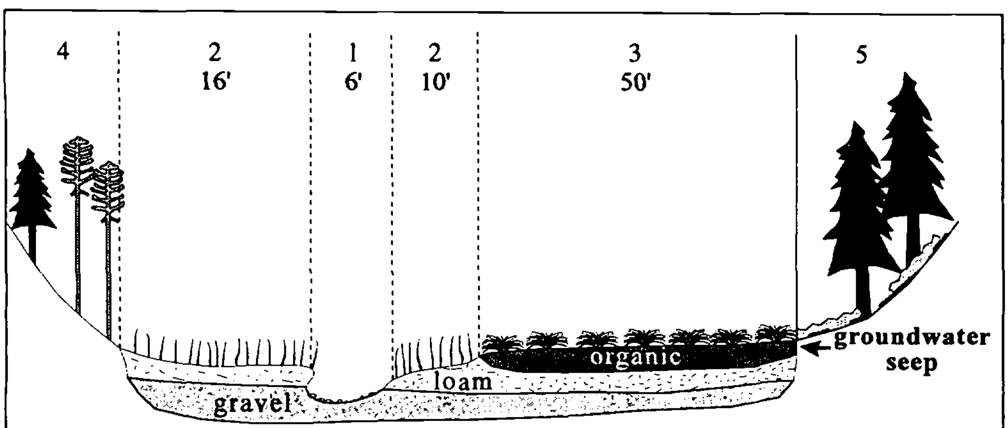
PHYSICAL ENVIRONMENT

The CACU2 association was sampled on Long Creek, Prairie City, and Bear Valley RDs (Malheur NF); North Fork John Day RD (Umatilla NF); and La Grande and Unity RDs (Wallowa-Whitman NF). It is a minor type found at moderate elevations (4140 to 5280 ft.) in 30-600 ft. wide, low to moderate gradient (1-5%), 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 5 ft. wide) 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.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4587	409
Plot Aspect (°)	169	74
Plot Slope (%)	2	2
Valley Width (m)	124	100
Valley Gradient (%)	2	1
Valley Aspect (°)	107	47
Soil Surface Cover (%)		
Submerged	3	4
Bare Ground	1	2
Moss	28	32
Liverwort	1	2
Litter	65	36

Soil Profile Characteristics

Bedrock/Parent Material(s)		basalt, sedimentary, mix. alluv.
Water Table Depth (cm)		0-61
Total Rooting Depth (cm)		23-106
Surface Layer		
Thickness (cm)		20-66
Texture(s)		hemic, fibric organic, organic silt loam, sandy loam
Coarse Fragments (%)		0
Roots	very fine: many	fine: few to many
	medium: none to many	coarse: few
Redoximorphic Features		none
Subsurface Layer(s)		
Thickness (cm)		13-80
Texture(s)		sapric, hemic, fibric organic organic loam, silty clay, clay loam
Coarse Fragments (%)		0-60, gravel
Roots	very fine: few to many	fine: few to many
	medium: none to many	coarse: none to few
Redoximorphic Features		some iron oxidation, gleying
Substrate		organics, gravel, clay



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

Figure 66. *Waucup Creek, La Grande RD, Wallowa-Whitman NF; very low gradient, mod. elevation, flat-shaped valley; Mesic Forest Zone 1.*

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. Adjacent vegetation types are: terraces - lodgepole pine communities, ponderosa pine-Douglas fir; sideslopes - grand fir/grouse huckleberry-twinflower, grand fir/twinflower, grand fir/pinegrass, ponderosa pine/Idaho fescue-bluebunch wheatgrass and other Douglas-fir and ponderosa pine associations.

Principal Species		**Con**	**Cov**
Sedges and Rushes			
CACU2	Cusick's sedge	100	77
CAUT	Bladder sedge	55	8
Perennial forbs			
POOC	Western polemonium	73	5
GEMA	Large-leaf avens	36	1
SAOR	Bog saxifrage	36	1
HADI2	White bog-orchid	36	1

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 1387 to 4033 (avg. 2563) lbs/acre. Grazing by large animals on these sites is not recommended because of the potential damage to the fragile, wet soils.

The Cusick's sedge probably burns only during very dry years. Reaction of Cusick's sedge to fire is unknown. Cusick's sedge may provide cover and forage (especially the seeds) for small mammals and birds.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

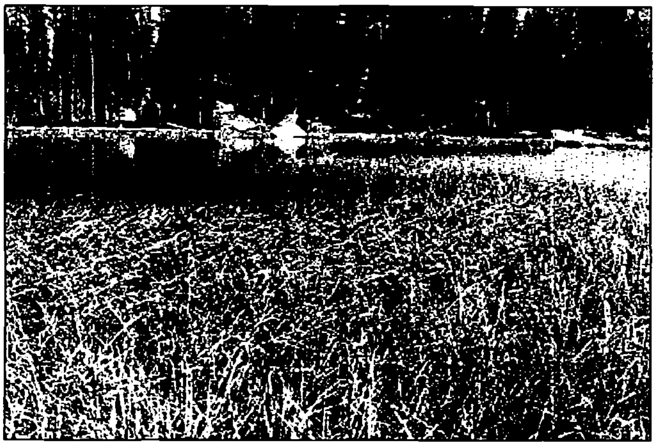
SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Seasonally Flooded to Saturated.

OTHER STUDIES

The CACU2 association has been described for eastern Washington (Kovalchik 1992). It has not been described elsewhere.

Bladder Sedge Plant Association

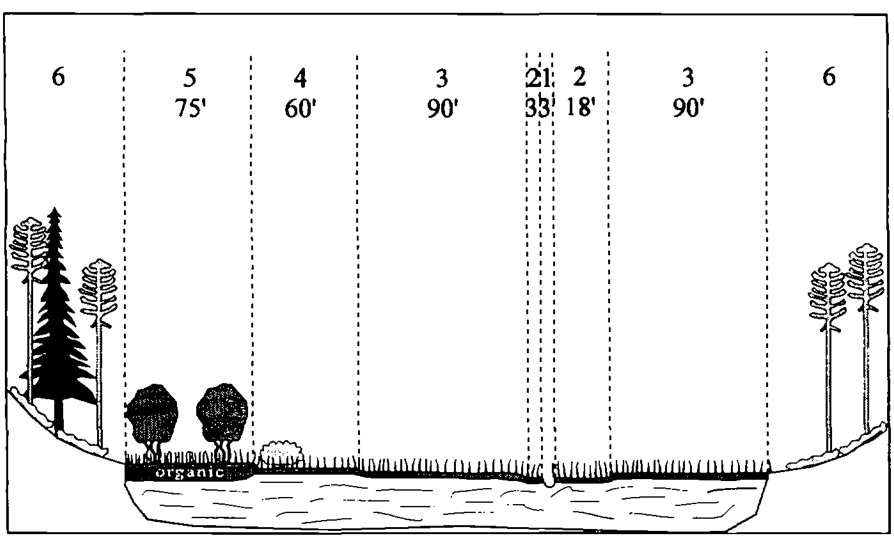
Carex utriculata MM2917
CAUT n=39



PHYSICAL ENVIRONMENT

The CAUT association occurs throughout the Blue and Wallowa Mountains. Sites were sampled on North Fork John Day and Walla Walla RDs (Umatilla NF); Bear Valley, Burns, and Prairie City RDs (Malheur NF); and Pine, Baker, Unity, La Grande, Hells Canyon NRA, and Wallowa Valley RDs (Wallowa-Whitman NF). It is found at moderate to high elevations (3860 to 7470 ft.) in wide, low gradient, flat- and trough-shaped valleys (sometimes in U-shaped or V-shaped valleys) with gentle to moderately steep side slopes. The CAUT association occurs in wet basins (fens) and springs, at the edge of ponds, on floodplains and occasionally on gravel bars. Where streams are present in the valley, they are C3, C4, E3, E4, E6, and F6 Rosgen stream types. Stream widths are 1-75 ft. wide (most are 5-15 ft. wide) with generally little organic debris affecting the active channel. Occasionally there is up to 30% large woody debris in the stream channel. Soils are Saprists, Hemists, Endoaquolls or Endoaqepts, and Fluvaquents. Mineral soils are generally very organic-matter rich and often have an incipient histic epipedon forming on the surface. These soils will eventually become Saprists or Hemists. Most of the mineral soils are fine-textured and have high water holding capacity. The soils are saturated to the surface well into the summer and the water table is usually within 50 cm of the soil surface late in the growing season. The CAUT association is one of the wettest associations.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4988	678
Plot Aspect (°)	117	76
Plot Slope (%)	2	1
Valley Width (m)	182	115
Valley Gradient (%)	2	1
Valley Aspect (°)	134	68
Soil Surface Cover (%)		
Submerged	14	26
Bare Ground	15	26
Gravel	1	3
Moss	9	22
Litter	36	36



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

Figure 67. *Lake Creek, North Fork John Day RD, Umatilla NF; very low gradient, mod. high elevation, flat-shaped valley; Mesic Forest Zone 1.*

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, rhyolite, andesite, mix. igneous, metamorphic and sedimentary, moraines
Water Table Depth (cm)	0-122
Total Rooting Depth (cm)	18-127
Depth to Redoximorphic Features (cm)	0-28
Surface Layer	
Thickness (cm)	10-56
Texture(s)	sapric, hemic organic, organic loam, silt loam
Coarse Fragments (%)	0
Roots	very fine: many; fine: common to many; medium: few to many; coarse: few to common
Redoximorphic Features	some iron oxidation
Subsurface Layer(s)	
Thickness (cm)	10-65
Texture(s)	sapric organic, sandy loam organic loam , clay loam
Coarse Fragments (%)	0-80, gravel, cobble
Roots	very fine: many; fine: common to many; medium: few to common; coarse: few to common
Redoximorphic Features	common iron oxidation, gleying
Substrate	gravel, cobble, sand, clay

VEGETATION COMPOSITION

Bladder sedge has at least 25% cover or is the dominant graminoid. It forms a dense herbaceous overstory, generally excluding abundant coverage by any other herbaceous species. 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 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-long saturation may exclude willow establishment because some willow species cannot tolerate prolonged submersion of their root crowns (Esser 1992, Tesky 1992). Vegetation types adjacent to sites sampled are: terraces - ponderosa pine/common snowberry, shrubby cinquefoil/Kentucky bluegrass, lodgepole pine communities, big sagebrush/Cusick's bluegrass, silver sagebrush/Cusick's bluegrass; sideslopes - grand fir/big huckleberry, grand fir/ grouse huckleberry-twinflower, subalpine fir-Engelmann spruce, ponderosa pine/big sagebrush/elk sedge, ponderosa pine/common snowberry and lodgepole pine communities.

Principal Species		**Con**	**Cov**
Sedges and Rushes			
CAUT	Bladder sedge	100	64
SCMI	Small-fruit bulrush	33	25
CAAQ	Aquatic sedge	26	26
Perennial Grasses			
DECE	Tufted hairgrass	26	17
Perennial Forbs			
POOC	Western polemonium	28	3
EPGL2	Common willow-herb	26	5

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 200 to 8000 (avg. 2753) lbs/acre. Bladder sedge palatability is rated as fair to good for cattle, horses, deer, and elk. It can withstand moderate grazing. Excessive grazing may allow Nebraska sedge to become dominant on the site. Lowering of the water table can change the potential altogether.

Fire is infrequent in this wet association, and it can be difficult to burn. Fire can consume the above-ground parts of bladder sedge, but the rhizomes survive most fires. Fire causes little herbaceous species composition change in CAUT (Cope 1992a).

Bladder sedge provides valuable breeding and feeding grounds for waterfowl. Common yellowthroats, red-winged blackbirds, song sparrows, and tree swallows are commonly associated with bladder sedge. On streambanks bladder sedge forms a dense sod that provides good shade and cover for fish, especially when banks are undercut (Cope 1992a).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

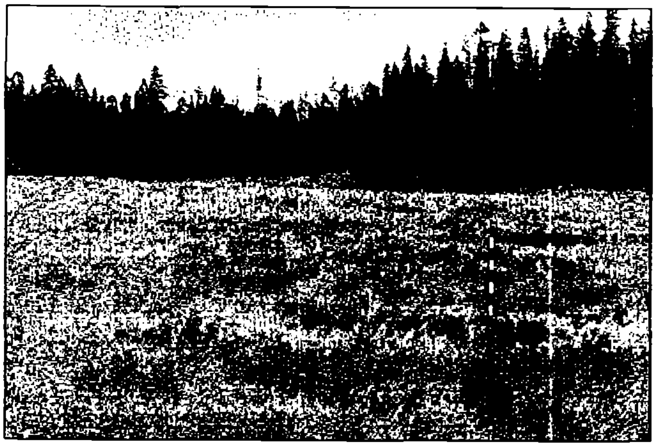
SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Seasonally Flooded to Saturated.

OTHER STUDIES

The CAUT association has been described for central Oregon and eastern Washington (Kovalchik 1987 and 1992), for the southern Malheur National Forest (Padgett 1981), for Montana (Hansen and others 1995), for Nevada (Manning and Padgett 1995) and for Utah, southeastern Idaho and western Wyoming (Padgett and others 1989, Youngblood and others 1985). It has been variously described as a plant association, a cover type, and a community type.

Inflated Sedge Plant Association

Carex vesicaria var. *vesicaria* MW1923
CAVEV n=13



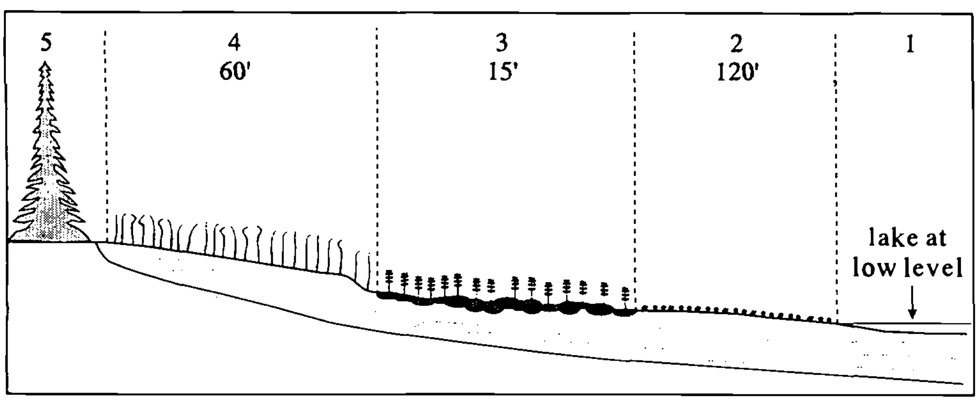
PHYSICAL ENVIRONMENT

The CAVEV association was sampled on Heppner and North Fork John Day RDs (Umatilla NF), Long Creek and Prairie City RDs (Malheur NF), and Pine and La Grande RDs (Wallowa-Whitman NF). It is probably widespread throughout the Blue Mountains Province. It is found at moderate to somewhat high elevations (3060 to 6340 ft.) in moderately wide (200 ft.), very low gradient U- and trough-shaped valleys with gentle side slopes. Sites are wet basins, pond edges, and an occasional floodplain. These sites are locations where water is standing or saturates the soils throughout the growing season in most years. Soils information is scanty. The few sites sampled were deep, fine-textured mineral soils with incipient histic epipedons. Water is often standing on the soil surface well into the summer. Abundance of bare ground rather than moss cover is also evidence of prolonged standing water on the site. The CAVEV association appears to occupy sites similar to the wetter end of the CAUT association. There may be some soil chemical or microclimatological factor that favors inflated sedge over bladder sedge.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4810	937
Plot Aspect (°)	100	62
Plot Slope (%)	2	3
Valley Width (m)	84	51
Valley Gradient (%)	1	2
Valley Aspect (°)	150	55
Soil Surface Cover (%)		
Submerged	9	28
Bare Ground	19	40
Moss	1	2
Litter	19	29

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, andesite, mixed igneous intrusive
Water Table Depth (cm)	38-114
Total Rooting Depth (cm)	33
Depth to Redoximorphic Features (cm)	23-33
Surface Layer	
Thickness (cm)	5-9
Texture(s)	fibric organic, organic loam
Coarse Fragments (%)	0
Roots very fine: many	fine: many
medium: none to common	coarse: none
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	31-36
Texture(s)	silty clay, silty clay loam, silt loam, very fine sand
Coarse Fragments (%)	0
Roots very fine: few to many	fine: many
medium: few	coarse: few
Redoximorphic Features	common iron oxidation
Substrate	clay, ash



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

Figure 68. *Strawberry Lake, Prairie City RD, Malheur NF; high elevation basin; Mesic Forest Zone 1.*

VEGETATION COMPOSITION

Inflated sedge forms a dense canopy with abundant litter beneath. On drier sites, tufted hairgrass can be abundant to co-dominant. Forbs, including common camas, Watson's willow-weed, leafy aster, groundsels, and leafy arnica, occur at low coverage unless the site is heavily disturbed by grazing. Nebraska sedge also increases on grazing-disturbed sites. Inflated sedge stands are unlikely to be seral to willow/sedge associations.

Principal Species		**Con**	**Cov**
Sedges and Rushes			
CAVEV	Inflated sedge	100	64
CANE	Nebraska sedge	42	31
JUBA	Baltic rush	42	8
Perennial grasses			
DECE	Tufted hairgrass	75	12
Perennial forbs			
CAQU	Common camas	33	6
EPWA	Watson's willow-herb	25	6

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass was measured on only one site (1600) lbs./acre. Inflated sedge is moderately high in palatability to livestock (Kovalchik 1987) and can be grazed late in the summer if the soils have dried. Grazing on organic soils should be avoided unless soils are completely dry at the surface. Inflated sedge sites can only be burned in late summer and fall after soils have dried. Fires will reduce litter and probably increase productivity for a few years afterward (Kovalchik 1987). As with other rhizomatous sedge associations, hot fires can burn up the organic layers and kill the rhizomes.

Nesting, hiding, and thermal cover are presumably good for water fowl and other birds and small mammals after the soils have dried.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

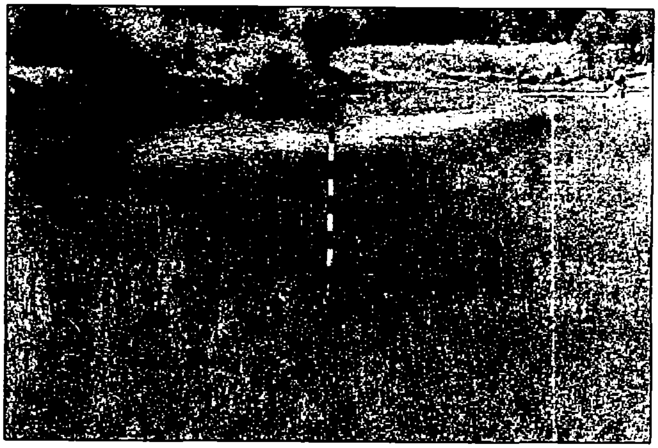
SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Seasonally Flooded, Saturated, or Semi-permanently Flooded.

OTHER STUDIES

The CAVEV association has been described for central Oregon (Kovalchik 1987 and 1992). Padgett and others (1989) and Youngblood and others (1985) described inflated sedge as a wetland type for Utah, eastern Idaho, and western Wyoming but did not sample or describe it. Hansen and others (1995) and Kovalchik (1992) included inflated sedge communities in CAUT types described for Montana and eastern Washington.

Creeping Spike-rush Plant Association

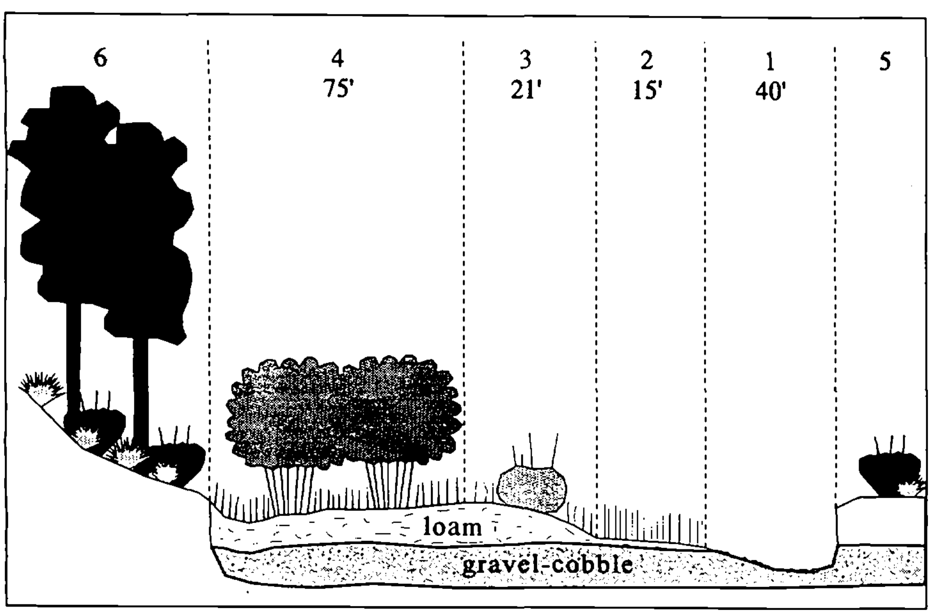
Eleocharis palustris	MW4912
ELPA	n=10



PHYSICAL ENVIRONMENT

The ELPA association was sampled on Long Creek and Burns RDs (Malheur NF); Heppner and Pomeroy RDs (Umatilla NF); and Unity, Hells Canyon NRA, and La Grande RDs (Wallowa-Whitman NF). It is found at moderate elevations (3060 to 5350 ft.) in 60-1000 ft. wide, low gradient valleys of all shapes. Sites are wet basins, floodplains, gravel bars, and lake edges. Where streams are present in the valley, they are C and E stream types. Stream widths are 5-50 ft. wide with little organic debris. Soils are Mollisols (Typic Endoaquolls) and Entisols (Mollic Endoaquents). Textures are variable. Some sites are very coarse-fragment rich and others are deep and fine textured. The surface of the soils is rich in organic matter. Sites may be submerged year round or flooded only in late spring with the water table dropping to 30-50 cm below the soil surface by late summer.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4333	842
Plot Aspect (°)	325	78
Plot Slope (%)	1	1
Valley Width (m)	219	149
Valley Gradient (%)	2	1
Valley Aspect (°)	144	74
Soil Surface Cover (%)		
Submerged	24	40
Bare Ground	12	19
Gravel	2	3
Rock	9	25
Moss	13	28
Litter	25	37
Soil Profile Characteristics		
Bedrock/Parent Material(s)		andesite, basalt, mixed sedimentary
Water Table Depth (cm)		0-45
Total Rooting Depth (cm)		15-20
Depth to Redoximorphic Features (cm)		8-16



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

Figure 69. *Silvies River, Burns RD, Malheur NF; very low gradient, mod. elevation, flat-shaped valley; Continental Zone*

Surface Layer

Thickness (cm)	5-15
Texture(s)	fibric organic, clay loam, loam, sand
Coarse Fragments (%)	0-50, gravel
Roots very fine: many	fine: many
medium: none to many	coarse: none to few
Redoximorphic Features	none

Subsurface Layer(s)

Thickness (cm)	12-43
Texture(s)	silty clay, silt loam, gravelly loam
Coarse Fragments (%)	1-70, gravel
Roots very fine: common to many	fine: none to many
medium: none to common	coarse: none to few
Redoximorphic Features	some iron oxidation

Substrate clay, gravel, cobble

VEGETATION COMPOSITION

Creeping spike-rush is an aggressive, rhizomatous species and excludes other species from establishing any great cover. Associated herbaceous species include field mint, shore buttercup, curly dock, western blue flag, small-winged sedge, and woolly sedge.

Principal Species		**Con**	**Cov**
Sedges and Rushes			
ELPA	Creeping spike-rush	100	59
Perennial Forbs			
MEAR3	Field mint	50	12

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 466 to 900 (avg. 536) lbs/acre. Creeping spike-rush is of little to no forage value to livestock and wild ungulates. On seasonally drier sites, ungulate trampling may cause creeping spike-rush cover to increase (Snyder 1992a).

Burning sites on which the creeping spike-rush association occurs is generally difficult due to the high moisture content of the soils and plants and the discontinuous litter layer. Most fires will kill only above-ground plant parts of creeping spike-rush, and plants will resprout from rhizomes. The litter layer may be reduced (Snyder 1992a).

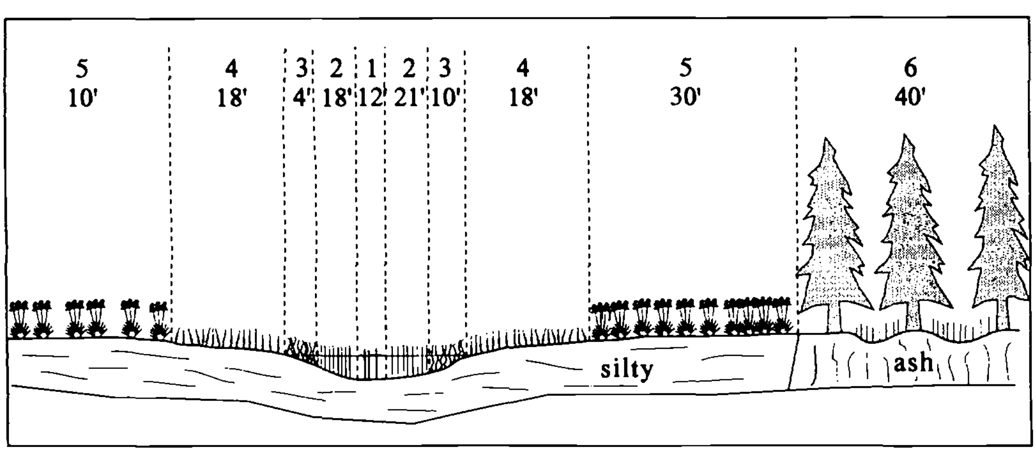
Ducks and geese eat the seeds of creeping spike-rush (Kovalchik 1987). Cover may be provided to waterfowl.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Seasonally Flooded to Semi-permanently Flooded.

OTHER STUDIES

The ELPA association has been described for central Oregon and eastern Washington (Kovalchik 1987 and 1992). Hansen and others (1995) described an *Eleocharis palustris* habitat type for Montana. Manning and Padget (1995) described an *Eleocharis palustris* cover type for Nevada. Padgett and others (1989) and Youngblood and others (1985) did not describe this association but listed it as a wetland community for Utah, eastern Idaho, and western Wyoming.



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

Figure 70. *Frog Heaven Meadows, La Grande RD, Wallowa-Whitman NF; headwater basin with pond and surrounding meadows; Mesic Forest Zone 1.*

Densely-tufted Sedge Plant Association

Carex lenticularis var. *lenticularis* MM2919
CALEL2 n=9

PHYSICAL ENVIRONMENT

The CALEL2 association is a minor type that was sampled on the Pine, Baker, and La Grande RDs (Wallowa-Whitman NF); Heppner and Pomeroy RDs (Umatilla NF); and Long Creek and Prairie City RDs (Malheur NF). It is found at moderate to high elevations (3905 to 6840 ft.) in 16-65 ft. 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 1-30 ft. wide with less than 10% to 30% of the stream channel affected by woody debris. Soils are Entisols (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.

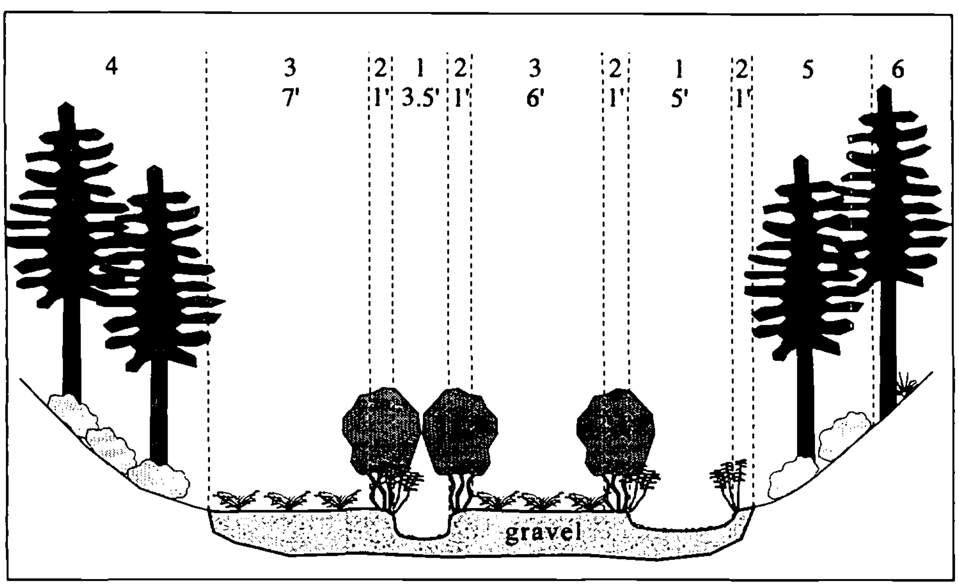
Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4989	818
Plot Aspect (°)	81	60
Plot Slope (%)	2	3
Valley Width (m)	15	9
Valley Gradient (%)	4	3
Valley Aspect (°)	93	66

Soil Surface Cover (%)

Submerged	2	3
Bare Ground	13	12
Gravel	7	13
Rock	10	27
Moss	21	25
Liverwort	2	4
Litter	16	21

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, andesite, moraines
Water Table Depth (cm)	38-70
Total Rooting Depth (cm)	25-43
Depth to Redoximorphic Features (cm)	7-24
Surface Layer	
Thickness (cm)	7-21
Texture(s)	silt loam, organic loam, loam
Coarse Fragments (%)	0-20, gravel, cobble
Roots very fine: many	fine: many
medium: many	coarse: common to many
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	9-68
Texture(s)	organic loam, loam, sandy clay loam fine to coarse sandy loam
Coarse Fragments (%)	0-30, gravel, cobble
Roots very fine: few to many	fine: many
medium: common	coarse: none
Redoximorphic Features	little iron oxidation
Substrate	gravel, cobble



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

Figure 71. *Little Crane Creek, Prairie City RD, Malheur NF; mod. low gradient, mod. elevation, V-shaped valley; Continental Zone*

VEGETATION COMPOSITION

Densely-tufted sedge cover varies from 25-95%. Other graminoids, such as small-winged sedge, creeping spikerush, small-fruit bulrush, 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. Adjacent sideslope vegetation types are: subalpine fir/big huckleberry, grand fir/big huckleberry, Douglas-fir/mallow ninebark, Douglas-fir/common snowberry, Douglas-fir/pinegrass, lodgepole pine-grand fir communities.

Principal Species		**Con**	**Cov**
Sedges and Rushes			
CALEL2	Densely-tufted sedge	100	40
CAMI	Small-winged sedge	67	4
JUBA	Baltic rush	44	13
Perennial Grasses			
GLEL	Tall mannagrass	44	13
Perennial Forbs			
MEAR3	Field mint	44	6
ACMI	Yarrow	44	3
MIMO	Musk monkey-flower	44	1
POOC	Western polemonium	44	1

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 833 to 2000 (avg. 1523) lbs/acre. Heavy grazing of this association decreases cover of densely-tufted sedge and increases cover of small-winged sedge and forbs.

Effects of fire on this association are unknown. Densely-tufted sedge may provide cover for small mammals, amphibians, and birds.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

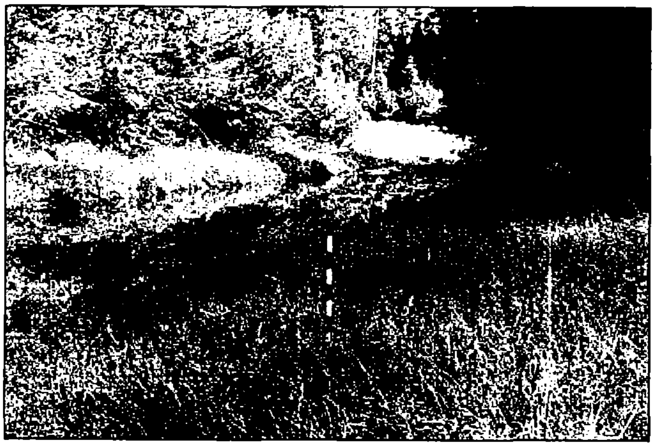
SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Seasonally Flooded.

OTHER STUDIES

Diaz and Mellon (1996) described a CALEL2 association for northwestern Oregon/southeastern Washington. Hansen and others (1995) included densely-tufted sedge communities in their *Carex aquatilis* habitat described for Montana.

Woolly Sedge Plant Association

Carex lanuginosa MM2911
CALA3 n=9



PHYSICAL ENVIRONMENT

The CALA3 association was sampled on the Burns, Prairie City, and Long Creek RDs (Malheur NF) and the La Grande and Unity RDs (Wallowa-Whitman NF). It is found at moderate (3950 to 5280 ft.) elevations in low gradient, trough-shaped (occasionally flat-shaped or V-shaped), moderately wide valleys with gentle to moderately steep side slopes. The CALA3 association occurs on floodplains and in wet basins and springs. Associated stream reach types are C3, C4, E4, and E6. Stream widths are 1-30 ft. wide (most are 5-15 ft. wide) with organic debris affecting about 10% of the active channel. Soils are Mollisols (Fluvaquentic and Typic Endoaquolls), Entisols (Typic and Mollic Endoaquents), and one Inceptisol (Histic Humaquept). Surface horizons are generally organic-matter rich and are fine-textured and have high water holding capacity. The soils have high water tables and are often flooded during spring runoff. The water table drops to about 20-60 cm below the soil surface by mid-summer.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4661	488
Plot Aspect (°)	146	76
Plot Slope(%)	2	1
Valley Width (m)	76	52
Valley Gradient (%)	2	1
Valley Aspect (°)	117	72
Soil Surface Cover (%)		
Submerged	11	25
Bare Ground	6	13
Gravel	1	3
Moss	7	13
Litter	58	42

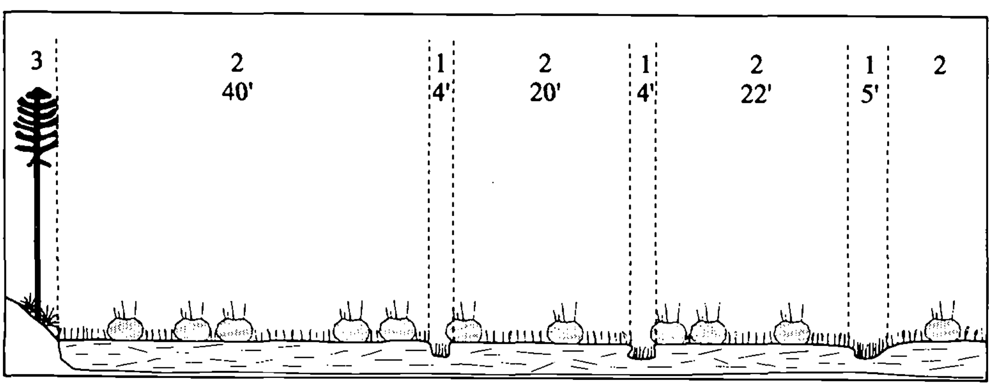
Soil Profile Characteristics

Bedrock/Parent Material(s): basalt, andesite, rhyolite, Clarno formation, unk. sedimentary, mixed alluvium
Water Table Depth (cm): 0-56
Total Rooting Depth (cm): 13-45
Depth to Redoximorphic Features (cm): 5-40

Surface Layer
Thickness (cm): 8-33
Texture(s): silty clay loam, hemic organic, organic loam, sandy loam
Coarse Fragments (%): 0-30, gravel, some cobble
Roots: very fine: many; fine: common to many; medium: few to common; coarse: common
Redoximorphic Features: some iron oxidation

Subsurface Layer(s)
Thickness (cm): 15-35
Texture(s): silt loam, sandy loam, silty clay loam hemic organic, clay loam
Coarse Fragments (%): 0-20, gravel, some cobble
Roots: very fine: common to many; fine: few to many; medium: few to common; coarse: none to few
Redoximorphic Features: common iron oxidation

Substrate: gravel, cobble, sand, ash



1 **Woolly sedge**-filled E6 and C6 stream reach channels
2 **Silver sage/Kentucky bluegrass,** floodplain
3 Lodgepole pine/pinegrass, east-facing sideslope

Figure 72. *Beaver Meadows, Unity RD, Wallowa-Whitman NF; mod. low gradient, mod. high elevation, trough-shaped valley; Continental Zone*

VEGETATION COMPOSITION

Woolly sedge has at least 25% cover and is the dominant graminoid on good condition sites. Other graminoids may be abundant, including tufted hairgrass, bluejoint reedgrass, small-fruit bulrush, Baltic rush, weak alkaligrass, and Kentucky bluegrass. Forbs, including large-leaf avens, field mint, common self-heal, Northwest cinquefoil, and western polemonium are present at low coverages. Sites may occasionally be seral to willow/woolly sedge as indicated by the presence of scattered willows.

Principal Species		**Con**	**Cov**
Sedges and Rushes			
CALA3	Woolly sedge	100	50
CAMI	Small-winged sedge	56	14
JUEN	Sword-leaf rush	56	14
SCMI	Small-fruit bulrush	44	21
JUBA	Baltic rush	44	16
Perennial Grasses			
PHPR	Common timothy	78	2
Perennial Forbs			
GEMA	Large-leaf avens	67	4
MEAR3	Field mint	44	7
PRVU	Common self-heal	44	7
POGR	Northwest cinquefoil	44	3

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 866 to 5000 (avg. 2617) lbs/acre. This is the driest of the rhizomatous sedge types and has received more livestock and wild ungulate use than other rhizomatous sedge associations. On overgrazed sites, woolly sedge will be replaced by Kentucky bluegrass. With continued heavy grazing, forbs will become abundant. Rest and mid to late season grazing will allow woolly sedge to increase in vigor and abundance. During seasons when the soils are wet, livestock should be kept off of CALA3 sites (Kovalchik 1987). Where the stream has been downcut and the water table lowered in the valley, the site potential may be changed to mountain big sagebrush or silver sagebrush/Cusick's bluegrass.

As with other rhizomatous sedges, woolly sedge can withstand low to moderate-temperature fires. Sites can usually be successfully burned late in the summer. Severe fires will burn surface organic layers and kill woolly sedge rhizomes. Both woolly sedge and Kentucky bluegrass will resprout from rhizomes following burning (Kovalchik 1987).

Woolly sedge sites are good habitat for deer and elk (Kovalchik 1987).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

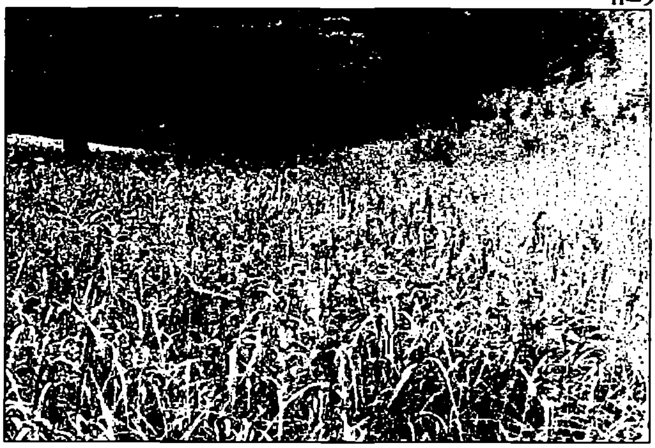
SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Seasonally Flooded.

OTHER STUDIES

The CALA3 association has been described for central Oregon (Kovalchik 1987) and as a community type for Utah and southeastern Idaho (Padgett and others 1989). Youngblood and others (1985) list it as a miscellaneous sedge community and Hansen and others (1995) include woolly sedge communities in their slender sedge habitat type.

Bluejoint Reedgrass Plant Association

Calamagrostis canadensis GM4111
CACA n=9



PHYSICAL ENVIRONMENT

The CACA association is a minor type occurring in the central and northern Blue and Wallowa Mountains. Sites were sampled on Pine, Baker, and La Grande RDs (Wallowa-Whitman NF) and North Fork John Day and Walla Walla RDs (Umatilla NF). It is found at moderate elevations (4760 to 5750 ft.) in 200-600 ft. wide, low gradient, trough-, flat, and, sometimes, V-shaped shaped valleys with gentle to steep side slopes. Sites are wet basins and floodplains. Stream reach types are C3, C4, E4, E5, and E6. Stream widths are 1-15 ft. wide. Woody debris affects from 0-30% of the active channel. Soils are Entisols (Mollic and Typic Endoaquents), Mollisols (Typic Endoaquolls), Inceptisols (Histic Humaquepts), and Histisols (Fluvaquentic Borohemists). There are 30-70 cm of fine-textured (clay loam to silty clay loam to silt loam) material over coarse fragment-rich buried stream beds. 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.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	5078	327
Plot Aspect (°)	261	67
Plot Slope (%)	2	1
Valley Width (m)	105	73
Valley Gradient (%)	2	1
Valley Aspect (°)	240	75
Soil Surface Cover (%)		
Submerged	2	7
Bare Ground	10	17
Moss	13	20
Litter	74	25

Soil Profile Characteristics

Bedrock/Parent Material(s): basalt, rhyolite, moraines, mixed alluvium
Water Table Depth (cm): 30-81
Total Rooting Depth (cm): 23-117
Depth to Redoximorphic Features (cm): 15-25

Surface Layer
- Thickness (cm): 5-46
- Texture(s): silt loam, hemic organic, sandy loam
- Coarse Fragments (%)
- Roots: very fine: common to many; fine: many; medium: few to common; coarse: few
- Redoximorphic Features: none

Subsurface Layer(s)
- Thickness (cm): 17-75
- Texture(s): silt loam, sandy loam, silty clay loam, clay loam
- Coarse Fragments (%): 0-60, gravel, cobble
- Roots: very fine: none to many; fine: few to many; medium: few to common; coarse: few
- Redoximorphic Features: common iron oxidation

Substrate: gravel, cobble, sand, clay

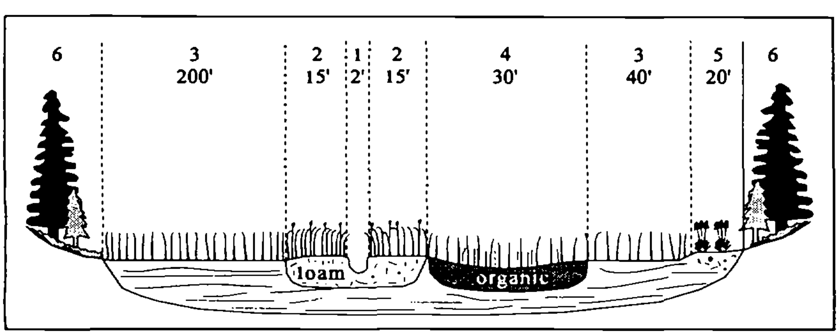


Figure 73. *Limber Jim Meadows, La Grande RD, Wallowa-Whitman NF; very low gradient, mod. high elevation, flat-shaped basin; Mesic Forest Zone 1.*

1 E4 stream reach
2 **Bluejoint reedgrass,** floodplain
3 **Bladder sedge,** wet meadow
4 **Bladder sedge** w/slender cottongrass, wet meadow
5 **Tufted hairgrass,** moint meadow
6 Engelmann spruce (grand fir)/grouse huckleberry-twinflower, surrounding sideslopes

VEGETATION COMPOSITION

Bluejoint reedgrass dominates the sites with 40-100% cover. Aquatic sedge, small-fruit bulrush, Baltic rush, tall mannagrass, and tufted hairgrass are commonly present and occasionally abundant. Forbs are usually scattered at low abundance and include western polemonium, white bog-orchid, Sitka burnet, large-leaf avens, common willow herb, musk monkey-flower, and violets. Adjacent sideslope vegetation types are: subalpine fir-Engelmann spruce/grouse huckleberry-twinflower, subalpine fir/twinflower, Douglas-fir/pinegrass, lodgepole pine communities.

Principal Species		**Con**	**Cov**
Perennial Grasses			
CACA	Bluejoint reedgrass	100	79
GLEL	Tall mannagrass	56	5
Sedges and Rushes			
CAAQ	Aquatic sedge	89	6
SCMI	Small-fruit bulrush	67	22
Perennial Forbs			
POOC	Western polemonium	67	4
HADI2	White bog-orchid	67	1
SASI2	Sitka burnet	56	9
GEMA	Large-leaf avens	56	1
EPGL2	Common willow-herb	56	1

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 1667 to 7533 (avg. 3352) lbs/acre. Bluejoint reedgrass has a poor to good palatability rating for wild ungulates and livestock. It is most palatable when plants are young and succulent. It can provide a large amount of forage for wild ungulates and livestock. Soils are wet and vulnerable to damage early in the growing season and grazing should be restricted (Tesky 1992b). Overgrazing will decrease the abundance of bluejoint reedgrass and can cause an increase in small-winged sedge, Baltic rush, or Kentucky bluegrass.

Bluejoint reedgrass will survive low and moderate intensity fires and resprout from rhizomes. It also readily colonizes burned areas through seed dispersal. Light surface burning generally increases the abundance of bluejoint reedgrass (Tesky 1992b).

Deer may use bluejoint reedgrass meadows for fawning and small mammals and birds may use meadows for cover.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Seasonally Flooded.

OTHER STUDIES

The CACA association has been described for central Oregon (a miscellaneous type) and eastern Washington (Kovalchik 1987 and 1992) and for Montana (Hansen and others 1995).

Tufted Hairgrass Plant Association

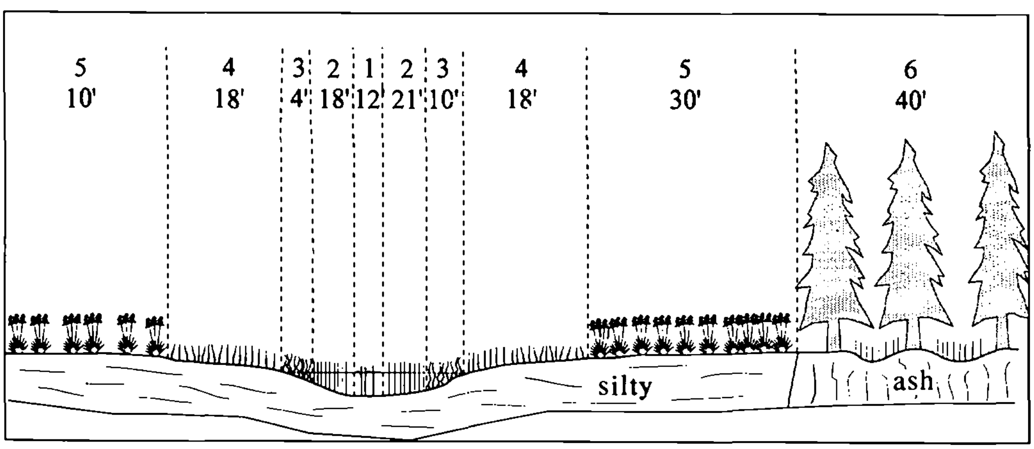
Deschampsia cespitosa MM1912
DECE n=29

PHYSICAL ENVIRONMENT

The DECE association is a widespread association throughout the Blue and Wallowa Mountains. Sites were sampled on Pine, Hells Canyon NRA, La Grande, WallowaValley, and Baker RDs (Wallowa-Whitman NF); Heppner, Walla Walla, and North Fork John Day RDs (Umatilla NF); and Long Creek, Prairie City, and Burns RDs (Malheur NF). Sites are wet, moist and dry basins, floodplains, stream terraces, and one spring. This association occurs at moderate to high elevations (4070-7230 ft.) in low gradient, moderately broad (100-300 ft.) to broad (greater than 1000 ft.), U- and trough-shaped valleys with gentle to moderately steep side slopes. Where streams are present they are C4, C6, and E6 Rosgen stream types. Stream widths are 1-30 ft. wide with less than 10% of the active channel affected by organic debris. Soils are Mollisols (Haploborolls and Endoaquolls), Inceptisols (Histic Humaquepts), Entisols (Mollic Endoaquents and Typic Cryaquents), and one Histosol (Fluvaquentic Borohemist). Soils are deep and fine-textured. The DECE association is found on very wet to fairly dry sites. On the wettest sites flooding occurs in the spring, and soils may be saturated into mid-summer. Most sites are wet at the soil surface early in the growing season and the water table drops to 30-80 cm by mid-summer. Soils generally remain moist throughout the year.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	5324	840
Plot Aspect (°)	23	74
Plot Slope (%)	1	1
Valley Width (m)	197	142
Valley Gradient (%)	1	1
Valley Aspect (°)	120	64
Soil Surface Cover (%)		
Submerged	1	4
Bare Ground	4	6
Moss	16	24
Litter	33	36

Soil Profile Characteristics	
Bedrock/Parent Material(s)	quartz diorite, rhyolite, andesite, basalt, moraines, mixed alluvium
Water Table Depth (cm)	0-119
Total Rooting Depth (cm)	10-50
Depth to Redoximorphic Features (cm)	10-74



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

Figure 74. *Frog Heaven Meadows, La Grande RD, Wallowa-Whitman NF; headwater basin with pond and surrounding meadows; Mesic Forest Zone 1.*

Surface Layer

Thickness (cm)	5-55
Texture(s)	silt loam, fibric organic, organic loam
Coarse Fragments (%)	0-15, gravel
Roots	very fine: many; fine: common to many; medium: none to common; coarse: none to few
Redoximorphic Features	none

Subsurface Layer(s)

Thickness (cm)	20-100+
Texture(s)	silt loam, silty clay loam, sandy loam
Coarse Fragments (%)	0-60, gravel
Roots	very fine: none to many; fine: few to many; medium: none to common; coarse: few
Redoximorphic Features	common iron oxidation

Substrate clay loam, gravel, sandy loam

VEGETATION COMPOSITION

Tufted hairgrass cover ranges from 25-100% and is the dominant graminoid. Other herbaceous species 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, Kentucky bluegrass, common timothy, alpine timothy, baltic rush, small-winged sedge, and Nebraska sedge. Vegetation types adjacent to sites sampled are: terraces - shrubby cinquefoil/Kentucky bluegrass, 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.

Principal Species		**Con**	**Cov**
Perennial Grasses			
DECE	Tufted hairgrass	100	54
POPR	Kentucky bluegrass	48	13
Sedges and Rushes			
JUBA	Baltic rush	66	21
CAMI	Small-winged sedge	45	14
Perennial Forbs			
POBI	American bistort	59	5
POGR	Northwest cinquefoil	55	13

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 900 to 5066 (avg. 2538) lbs/acre. Tufted hairgrass is highly palatable to cattle and sheep and moderately palatable to elk. Moderate grazing from mid to late in the season can occur without detriment to tufted hairgrass meadows. Tufted hairgrass is still palatable to livestock at that time. Close grazing of the plants over many seasons reduces their vigor and reproductive capability (Kovalchik 1987). Overgrazing of tufted hairgrass meadows will kill tufted hairgrass, and it will be replaced by forbs and Kentucky bluegrass. Where the water table is high it is often replaced by Baltic rush and Nebraska sedge.

Effects of fire on tufted hairgrass may be similar to effects on other tufted grass species. A light fire may only burn above-ground plant parts leaving the root crown intact to resprout. A hot fire probably kills the crown leaving the site open for colonization by forbs, rhizomatous graminoids, or seeds of tufted hairgrass from off-site sources.

Tufted hairgrass sites are good habitat for mice, gophers, and ground squirrels (Kovalchik 1987).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

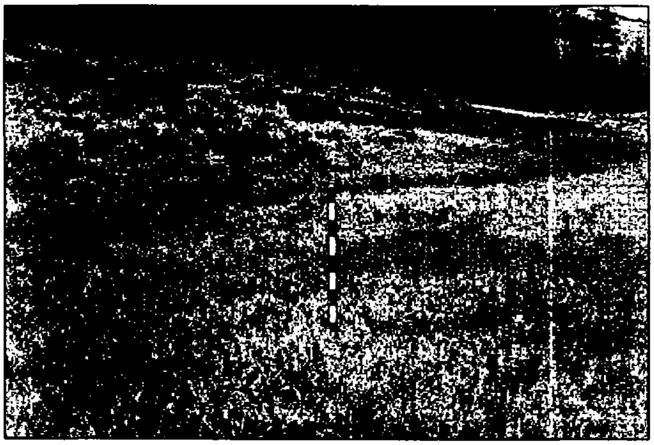
SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Seasonally Flooded to Temporarily Flooded.

OTHER STUDIES

The DECE association occurs throughout the western United States. It has been described for central Oregon and eastern Washington by Kovalchik (1987, 1992). It has been described as a community type for western Wyoming, eastern Idaho, and Utah (Youngblood and others 1985, Padgett and others 1989) as a cover type for Nevada (Manning and Padgett 1995) and as a habitat type for Montana (Hansen and others 1995).

Nebraska Sedge Plant Community Type

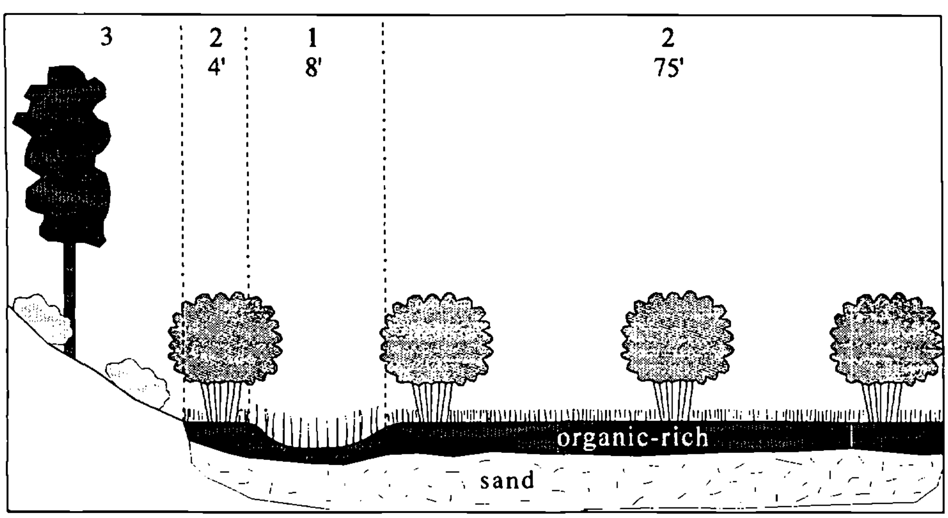
Carex nebrascensis	MM2912
CANE	n=17



PHYSICAL ENVIRONMENT

The CANE community type has widespread distribution in the Blue Mountains. Sites were sampled at moderate elevations (3930-5460 ft.) on Heppner and North Fork John Day RDs (Umatilla NF); Long Creek, Bear Valley, and Burns RDs (Malheur NF); and Unity and La Grande RDs (Wallowa-Whitman NF). CANE occurs on other districts but doesn't appear to be as widespread in the Wallowa Mountains as in the central and southern Blue Mountains. It occurs in moderately wide to wide (100-1000 ft.), low to moderate gradient, trough- and U-shaped valleys with gentle to moderately steep side slopes. Sites are wet basins (fens), floodplains, and springs. Where streams are present in the valley, they are C3, E6, and F6 Rosgen stream types. Stream widths are 1-30 ft. and woody debris in the stream channel varies from none to 50%. Soils are Mollisols (Endoaquolls, Hapludolls), Andisols (Endoaquands), Entisols (Endoaquents), Inceptisols (Humaquepts), and Borohemists. The wide variety of soils reflects the variety of plant associations for which the CANE community type is seral. Soils are generally deep and fine-textured with high water holding capacity. Two soils were less than 50 cm deep to the buried stream bed. The water table is near the surface or even flooding the site early in the growing season but drops to 30-50 cm below the soil surface by mid-summer.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4784	426
Plot Aspect (°)	250	65
Plot Slope (%)	3	3
Valley Width (m)	150	108
Valley Gradient (%)	2	1
Valley Aspect (°)	193	68
Water Table Depth (cm)	31	27
Depth to Mottling (cm)	11	8
Soil Surface Cover (%)		
Submerged	15	28
Bare Ground	7	13
Moss	3	10
Litter	28	35
Soil Profile Characteristics		
Bedrock/Parent Material(s)		basalt,andesite
Water Table Depth (cm)		0-64
Total Rooting Depth (cm)		15-84
Depth to Redoximorphic Features (cm)		5-23



1 **Nebraska sedge**-filled swale

2 **Willow/Kentucky bluegrass (Willow/woolly sedge** potential), floodplain

3 Ponderosa pine/common snowberry, northeast-facing sideslope

Figure 75. *S. Fk. Murderer's Creek, Bear Valley RD, Malheur NF; mod. low gradient, mod. elevation, trough-shaped valley; Mesic Forest Zone 1.*

Surface Layer		
Thickness (cm)		5-46
Texture(s)		silt loam, fibric and hemic organic
Coarse Fragments (%)		0
Roots	very fine: common to many	fine: common to many
	medium: few to common	coarse: few to common
Redoximorphic Features		none
Subsurface Layer(s)		
Thickness (cm)		13-71
Texture(s)		silt loam, sandy loam, silty clay loam
Coarse Fragments (%)		0-20, gravel
Roots	very fine: few to many	fine: few to many
	medium: few to many	coarse: none to few
Redoximorphic Features		some iron oxidation
Substrate		clay loam, loamy clay, gravel

VEGETATION COMPOSITION

Excessive grazing on sites dominated by Nebraska sedge has eliminated or greatly reduced the normal dominants. Potential natural vegetation types are bladder sedge, inflated sedge, woolly sedge, tufted hairgrass, and aquatic sedge associations. Common herbaceous species found in this community type are Baltic rush, sword-leaf rush, creeping spikerush, small-winged sedge, tall mannagrass, Kentucky bluegrass, common monkey-flower, Watson's willow-herb, American speedwell, and clovers. With continued overgrazing, Nebraska sedge cover can decrease, and other graminoids and forbs will become co-dominant. If the water table in the valley is lowered, the site potential may change and Baltic rush or Kentucky bluegrass may become dominant.

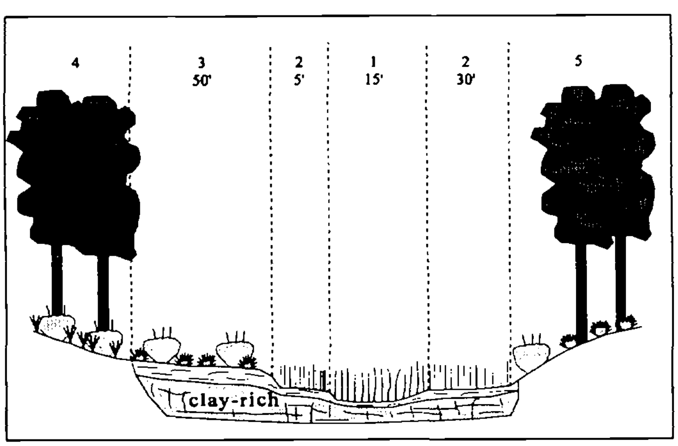


Figure 76. *S. Fk. Trout Creek, Burns RD, Malheur NF; very low gradient, mod. high elevation, trough-shaped valley; Continental Zone.*

Principal Species		**Con**	**Cov**
Sedges and Rushes			
CANE	Nebraska sedge	100	71
JUBA	Baltic rush	65	16
JUEN	Sword-leaf rush	29	2
Perennial Grasses			
DECE	Tufted hairgrass	35	6
POPR	Kentucky bluegrass	35	4
GLEL	Tall mannagrass	29	12
Perennial Forbs			
MIGU	Common monkey-flower	29	5
VEAM	American speedwell	24	3

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 1766 to 5233 (avg. 2468) lbs/acre. Nebraska sedge is highly palatable to livestock (Hansen and others 1995, Kovalchik 1987). It is resistant to moderately high grazing pressure and will increase in abundance as other sedges are decreasing. It is also palatable to elk (Hansen and others 1995).

Nebraska sedge is fairly resistant to fire. Fire will reduce litter and temporarily increase vegetative production. Sites should be rested from grazing during the year prior to prescribed burning (Hansen and others 1995).

Nebraska sedge provides food and cover for waterfowl (Hansen and others 1995).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Seasonally Flooded to Saturated.

OTHER STUDIES

A CANE community type has been described for Utah, eastern Utah, western Wyoming, Montana, and central Oregon (Padgett and others 1989, Youngblood and others 1985, Hansen and others 1995, Kovalchik 1987).

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

Baltic Rush Plant Community Type

Juncus balticus MW3912
JUBA n=15

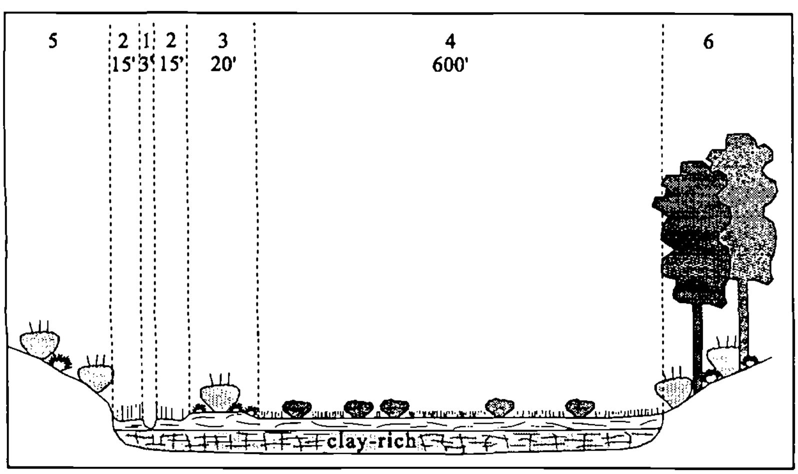
PHYSICAL ENVIRONMENT

The JUBA community type is widespread in the central and southern Blue and Wallowa Mountains. It was sampled on Prairie City, Long Creek, Bear Valley, and Burns RDs (Malheur NF); North Fork John Day RD (Umatilla NF); and Unity, Baker, Pine, and Wallowa Valley RDs (Wallowa-Whitman NF). It is found at moderate elevations (3820 to 5600 ft.) in 100-1000 ft. 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 C3, C4, C6, E4, E6 and F4. Stream widths are 1 ft. to more than 30 ft. wide. Woody debris is usually absent but can be present in as much as 30% of the active channel. 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 below the soil surface late in the growing season.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4874	629
Plot Aspect (°)	240	77
Plot Slope (%)	2	1
Valley Width (m)	148	98
Valley Gradient (%)	2	1
Valley Aspect (°)	261	64
Soil Surface Cover (%)		
Submerged	6	18
Bare Ground	5	6
Rock	2	6
Moss	7	20
Litter	48	44

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, andesite moraines, mixed alluvium
Water Table Depth (cm)	31-76
Total Rooting Depth (cm)	25->80
Depth to Redoximorphic Features (cm)	0-69
Surface Layer	
Thickness (cm)	10-30
Texture(s)	silt loam, silty clay loam, hemic organic
Coarse Fragments (%)	0-1, gravel
Roots	very fine: many; fine: common to many; medium: few to common; coarse: few to many
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	12-69



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

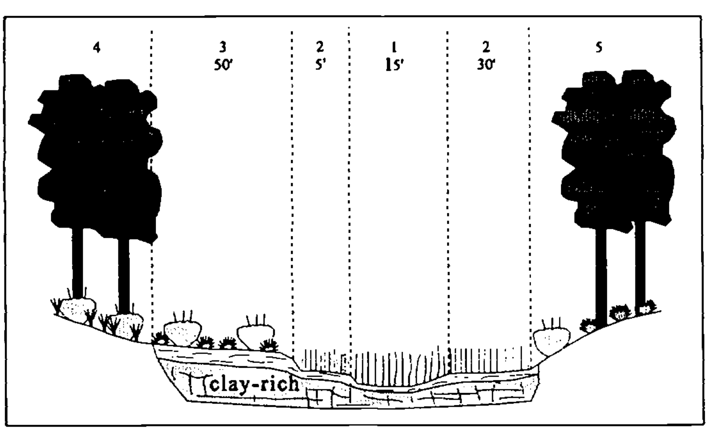
Figure 77. *Wickiup Creek, Bear Valley RD, Malheur NF; mod. gradient, mod. high elevation, trough-shaped valley; Continental Zone*

Texture(s)	silt loam, sand, sandy loam, clay loam sapric organic
Coarse Fragments (%)	0-50, gravel
Roots	very fine: none to many; fine: few to common; medium: few to common; coarse: few to many
Redoximorphic Features	some iron oxidation/reduction
Substrate	sand, gravel, cobble, clay loam

VEGETATION COMPOSITION

Baltic rush cover ranges from 20-90%. Cover by other graminoids is usually low. Cover by forbs can be low or high. Common herbaceous species present in baltic rush communities are yarrow, large-leaf avens, Northwest cinquefoil, American bistort, common camas, western polemonium, Kentucky bluegrass, common timothy, tufted hairgrass, creeping bentgrass, woolly sedge, and aquatic sedge. This community type is found on sites formerly occupied by several associations and community types, including woolly sedge, aquatic sedge, tufted hairgrass, and Nebraska sedge. 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 potential vegetation.

Principal Species		**Con**	**Cov**
Sedges and Rushes			
JUBA	Baltic rush	100	55
Perennial Grasses			
POPR	Kentucky bluegrass	87	15
PHPR	Common timothy	67	9
DECE	Tufted hairgrass	47	9
Perennial Forbs			
ACMI	Yarrow	67	6
GEMA	Large-leaf avens	47	4



1 **Nebraska sedge**-filled F6 stream reach
2 **Baltic rush,** floodplain
3 **Big sagebrush/ Cusick'sbluegrass,** terrace
4 Ponderosa pine/big sagebrush/ elk sedge, southwest-facing sideslope
5 Ponderosa pine/Idaho fescue-bluebunch wheatgrass, northeast-facing sideslope

Figure 78. *S. Fk. Trout Creek, Burns RD, Malheur NF; very low gradient, mod. high elevation, trough-shaped valley; Continental Zone*

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 1233 to 3333 (avg. 2145) lbs/acre. Baltic rush can be an important forage species for livestock and elk, although observed grazing of plants was low. Palatability is high only in the spring when plants are still succulent. Baltic rush increases with grazing. To protect soils sites should not be grazed when wet. Baltic rush has an extensive system of rhizomes and can provide good erosion control if sedges have been lost from the site (Snyder 1992b).

Fire does little harm to Baltic rush. Studies have shown that the coverage remains the same or increases (Snyder 1992b).

Baltic rush provides good nesting, hiding, and feeding cover for waterfowl and shorebirds. It can also provide cover for small mammals (Snyder 1992b).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

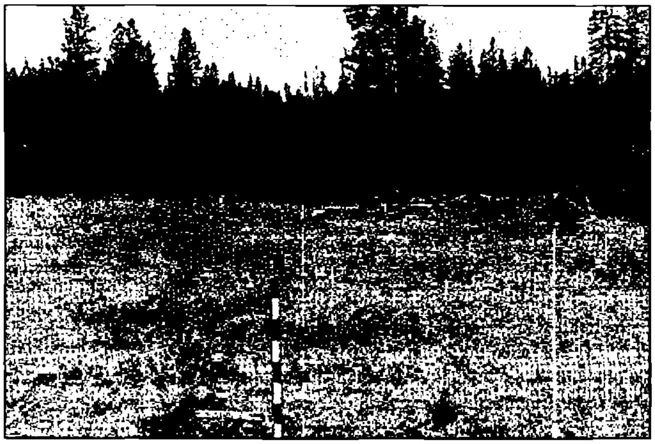
SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Temporarily Flooded to Seasonally Flooded to Saturated.

OTHER STUDIES

The JUBA community type has been described throughout the western United States. Community types or cover types have been described for central Oregon, the southern Malheur National Forest, Nevada, Utah, southeastern Idaho, western Wyoming and Montana (Kovalchik 1987, Padgett 1981, Manning and Padgett 1995, Padgett and others 1989, Youngblood and others 1985, Hansen and others 1995).

Kentucky Bluegrass Plant Community Type

Poa pratensis	MD3111
POPR	n=10



PHYSICAL ENVIRONMENT

The POPR community type is widespread throughout the Blue and Wallowa Mountains where overgrazing and other major disturbances have degraded the native vegetation and allowed Kentucky bluegrass, common timothy, or creeping bentgrass to become the dominant species. Sites were sampled on North Fork John Day and Walla Walla RDs (Umatilla NF), Burns and Prairie City RDs (Malheur RD), and Baker RD (Wallowa-Whitman NF). It is found at moderate elevations (4000 to 5481 ft.) in 100 ft. to greater than 1000 ft. wide, low gradient, U- and trough-shaped valleys with gentle to moderately steep side slopes. Sites are moist and dry basins and floodplains. Two streams were sampled: both C5 types. Only two soils were sampled. They are an Entisol and an Endoaquoll. Water holding capacity is high on these sites, but they are usually only wet to the surface in spring (rather than flooded), and the water table has dropped to 50-100 cm below the soil surface by late summer. The soil surface is often compacted by grazing or machinery impacts. On sites where the adjacent stream has been severely degraded, the water table will be lower and the original site potential may be changed.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4620	463
Plot Aspect (°)	4	50
Plot Slope (%)	3	2
Valley Width (m)	183	140
Valley Gradient (%)	2	1
Valley Aspect (°)	334	71
Soil Surface Cover (%)		
Submerged	11	30
Bare Ground	10	5
Moss	3	4
Litter	66	36

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, mixed sedimentary, mixed igneous extrusive
Water Table Depth (cm)	4-41
Total Rooting Depth (cm)	13->36
Surface and Subsurface Layers	insufficient data

VEGETATION COMPOSITION

Kentucky bluegrass, common timothy, or creeping bentgrass dominates the site. The latter two species are usually seeded on a site that would otherwise have been invaded by Kentucky bluegrass. Various "increaser" forbs and graminoids, including yarrow, broadpetal strawberry, common dandelion, rosy pussytoes, cinquefoils, oregon checkermallow, asters, small-winged sedge, Baltic rush, bearded wheatgrass, and Colorado rush are present at moderate to abundant cover. This community type is found on sites formerly occupied by several plant associations, including (but not necessarily limited to) woolly sedge, willow/woolly sedge, mountain alder/mesic forb, tufted hairgrass, aquatic sedge, and willow/aquatic sedge. Observation of the elevation, valley type, fluvial surface, stream type and present condition, and patches of remnant native vegetation are important in deciphering the original potential vegetation on the site. Wet meadows in broad basins were probably sedge or willow/sedge associations. Drier meadows were probably tufted hairgrass sites. Narrower valleys with small C or B type streams may have been mountain alder/mesic forb sites.

Principal Species		Con	Cov
Perennial Grasses			
POPR	Kentucky bluegrass	90	25
PHPR	Common timothy	60	17
AGST	Creeping bentgrass	10	70
FERU	Red fescue	10	40
Sedges and Rushes			
CAMI	Small-winged sedge	50	6
JUBA	Baltic rush	40	6
JUCO	Colorado rush	20	13
Perennial Forbs			
ACMI	Yarrow	90	11
FRVI	Broad-petal strawberry	60	5
TAOF	Common dandelion	40	5

MANAGEMENT CONSIDERATIONS

Only two herbaceous biomass samples were collected. The average was 837 lbs./acre. Kentucky bluegrass dominance on a site is usually the result of heavy grazing, especially when destabilization of the stream banks and bed occurs and results in lowering of the water table. Other ground disturbances that can favor Kentucky bluegrass domination are heavy machinery use associated with logging, mining or road-building, off-road vehicle use, and repeated or large-scale camping. Common timothy and creeping bentgrass communities are often the result of seeding to stabilize bare soils in meadows. Kentucky bluegrass, common timothy, and creeping bentgrass do not provide as much stabilization of floodplains and streambanks as the native, rhizomatous sedges that they replace. Kentucky bluegrass and common timothy are highly palatable to livestock, elk, pronghorn, mule deer, and white-tailed deer (Uchytil 1993, Esser 1993, Esser 1994). Creeping bentgrass has fair to good palatability for livestock, elk, and mule deer; poor palatability for pronghorn; and fair palatability for small mammals and birds. Kentucky bluegrass and common timothy are most nutritious in the spring but remain fairly nutritious throughout the summer on moist sites. Creeping bentgrass remains highly palatable all summer. All are highly resistant to grazing (Uchytil 1993, Esser 1993, Esser 1994). With severe overgrazing these grasses can decrease in abundance and be replaced by forbs (Kovalchik 1987). Once established, these grasses are aggressive and difficult to replace with native vegetation. On sites where the water table has been lowered through stream degradation, raising the water table to its original level may allow the original sedges, willow, or alder to reestablish.

Kentucky bluegrass and common timothy are moderately resistant to fire. Seed production and rhizome growth may be stimulated by fires. When plants are dormant, cool fires have little effect. There is evidence that late spring burning, when plants have reached full development and major food reserves have been depleted, causes the most injury to plants. Repeated late spring burning can actually rid a site of Kentucky bluegrass. If the site receives ample moisture after the fire, however, burning may have no effect or may increase the bluegrass abundance (Uchytil 1993, Esser 1993). Little is known about the effects of fire on creeping bentgrass. It is probably fairly resistant to low intensity fires and will reproduce from rhizomes (Esser 1994).

Small mammals and birds may find good cover and foraging in Kentucky bluegrass stands. Leaves and seeds are eaten and can be an important food for cottontail rabbits. Open stands of Kentucky Bluegrass, timothy, and creeping bentgrass are good habitat for the northern pocket gopher, the Columbia ground squirrel, and mice species, which in turn makes good foraging grounds for raptors (Uchytil 1993). Common timothy is grazed by rodents and birds eat the seeds. It has fair to good cover value for birds and small mammals (Esser 1993). Creeping bentgrass is good cover for large upland birds and waterfowl and fair cover for small birds and mammals (Esser 1994).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Temporarily Flooded.

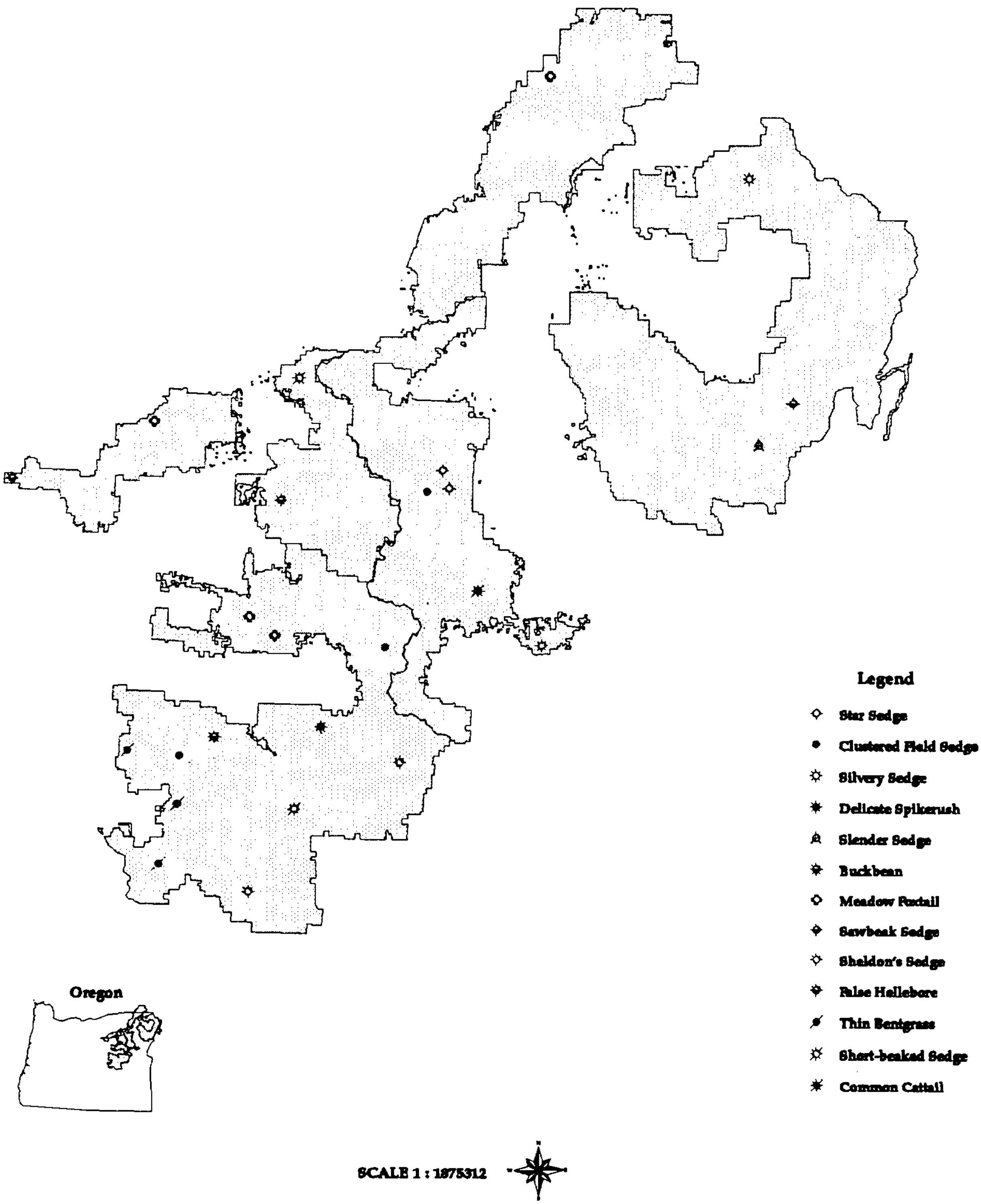
OTHER STUDIES

The POPR community type has been described for central Oregon and eastern Washington (Kovalchik 1987 and 1992), for Nevada (Manning and Padgett 1995), for Utah, eastern Utah and western Wyoming (Padgett and others 1989, Youngblood and others 1985), for Montana (Hansen and others 1995), and for the southern Malheur National Forest (Padgett 1981).

Figure 79. Following page
Sample sites for miscellaneous herbaceous meadow types. This map does not represeent the actual distribution of these herbaceous types.

Herbaceous Miscellaneous Types

Meadows



Few-flowered Spikerush Plant Association

Eleocharis pauciflora MW4911
ELPA2 n=5

The few-flowered spikerush association occurs where shallow drainageways cross high elevation headwater basin meadows, often where no true stream channel has formed. Few-flowered spikerush (ELPA2) is the dominant species. Other herbaceous species present include nodding chickweed, slender muhly, field woodrush, tufted hairgrass, and aquatic sedge. This type is widespread in the Blue and Wallowa Mountains where cirque basins and bogs occur. Sites are shallowly flooded most of the year and soils remain saturated. Vegetation types on adjacent sideslopes are subalpine fir associations. This type is described as an association, habitat type, community type, or cover type for central Oregon, eastern Washington, Nevada, Utah, and southeastern Idaho and Montana (Kovachik 1987, Kovachik 1992, Manning and Padgett 1995, Padgett and others 1989, Hansen and others 1995).

Star Sedge Plant Community Type

Carex muricata
CAMU2 n=2

Sites were sampled at 6730-7030 ft. elevation in the Elkhorn Mountains on Baker RD (Wallowa-Whitman NF) in headwater basins. Star sedge (CAMU2) dominates the site with a few scattered graminoids and forbs, including alpine shooting star (DOAL), few-flowered spikerush (ELPA2), and aquatic sedge (CAAQ). The soils are Typic Borohemists and are saturated throughout the growing season. Upland vegetation types adjacent to meadows are subalpine fir/grouse huckleberry and other subalpine fir associations.

Clustered Field Sedge Plant Community Type

Carex praegracilis
CAPR5 n=3

Clustered field sedge communities were sampled at moderate to high elevations (4640-6820 ft.) on Prairie City and Bear Valley RDs (Malheur NF) and Baker RD (Wallowa-Whitman NF). It occurs in headwater basins containing E5 and E6 Rosgen stream types. Clustered field sedge (CAPR5) is the dominant graminoid on good condition sites. Other species present include few-flowered spikerush (ELPA2), Northwest cinquefoil (POGR), yarrow (ACMI), and slender muhly (MUFI). Soils are Borohemists and Mollisols. The water table fluctuates between the soil surface and 25 cm. Vegetation types adjacent to sites sampled are: terraces - shrubby cinquefoil/Kentucky bluegrass; sideslopes - lodgepole pine-western larch and subalpine fir associations.

Silvery Sedge Plant Community Type

Carex canescens
CACA4 n=2

Two sites were sampled on Wallowa Valley and Baker RDs (Wallowa-Whitman NF) 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. Silvery sedge (CACA4) is very dominant (80-98% cover) with a few scattered forbs and graminoids (sword-leaf rush ([JUEN], slender muhly [MUFI], and sweetmarsh butterweed [SEFO]) and a dense moss cover. The water table is at or near the soil surface throughout the year. Vegetation types adjacent to sites sampled are: terraces - ponderosa pine/Kentucky bluegrass; sideslopes - Douglas-fir/pinegrass and some drier grand fir associations.

Buckbean Plant Community

Menyanthes trifoliata
METR n=1

This community was sampled on Bear Valley RD (Malheur NF) at 4920 ft. elevation in a trough-shaped, very low gradient, wide valley containing a narrow E6 Rosgen stream type. Most of the site is submerged throughout the year. Buckbean (METR) dominates the site with bladder sedge (CAUT) and inland sedge (CAIN) also abundant on the site. The soil is a Typic Borofibrist with a tremendous root mass formed by the buckbean. Ponderosa pine associations are on adjacent sideslopes.

Slender Sedge Plant Community

Carex lasiocarpa MM2920
CALA4 n=1

This community was sampled in the Duck Lake basin on Pine RD (Wallowa-Whitman NF). This community is described for central Oregon, eastern Washington, Montana and Utah and southeastern Idaho (Kovalchik 1987, Kovalchik 1992, Hansen and others 1995, Padgett and others 1989). It may be more extensive at high elevations in the Wallowa Mountains. Slender sedge cover (CALA4) is 100%. The soil is a Typic Borofibrist. The root mass of slender sedge in the soil prevents other species from achieving great abundance on the site. Sideslope vegetation types are: grand fir/huckleberry and other grand fir associations.

Delicate Spikerush Plant Community

Eleocharis bella
ELBE n=1

One site was sampled on the exposed mudflat of Strawberry Lake on Prairie City RD (Malheur NF) (Figure XX). Delicate spikerush (ELBE) has 90% cover with scattered shortawn foxtail (ALAE), creeping buttercup (RARE), and western yellowcress (ROCU). The soil is a Limnic Borosaprist and is moist to the surface. The water table was at 20 cm below the soil surface at the time of sampling. Subalpine fir associations surround the lake basin.

Short-beaked Sedge Plant Community Type

Carex simulata MM2915
CASI2 n=2

Two sites were sampled on Burns RD (Malheur NF) and North Fork John Day RD (Umatilla NF) at 4980 and 5990 ft. elevation. This community may be scattered throughout the Burns and Prairie City RDs south of the Strawberry and Aldrich Mountains. It is reported to be an incidental type in central Oregon, Nevada, Utah, eastern Idaho, western Wyoming, and Montana (Kovalchik 1987, Manning and Padgett 1995, Padgett and others 1989, Youngblood and others 1985, Hansen and others 1995). The site is dominated by short-beaked sedge (CASI2) with scattered tufted hairgrass (DECE), slender muhly (MUFI), Baltic rush (JUBA), aquatic sedge (CAAQ), Jeffrey's shooting star (DOJE), and elephants' head (PEGR). One site was adjacent to an E6 stream reach. The soil is an Endoaquoll with an incipient histic epipedon. The water table was 57 cm below the soil surface when this site was sampled. Other classifications report that this community type usually occurs on organic soils with the water table at or near the surface throughout the year.

Saw-beak Sedge Plant Community Type

Carex stipata
CAST n=2

Two sites were sampled at moderate elevations (3660-4000 ft.) on North Fork John Day RD (Umatilla NF) and Hells Canyon NRA (Wallowa-Whitman NF). Both sites were in 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. Saw-beak sedge (CAST) cover was 50-60% with abundant small-fruit bulrush (SCMI) and, on one site, tall mannagrass (GLEL). Other herbaceous species present include Watson's willow-herb (EPWA), musk monkey-flower (MIMO), curly dock (RUCR), common willow-herb (EPGL2), and streambank butterweed (SEPS).

Sheldon's Sedge Plant Community Type

Carex sheldonii
CASH n=3

Although only three sites were sampled (Prairie City RD and Burns RDs, Malheur NF; North Fork John Day RD, Umatilla NF), this community type 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. Sheldon's sedge (CASH) dominated the site with 98% cover. Other species present include western polemonium (POOC), common cowparsnip (HELA), and sweet-scented bedstraw (GATR). The water table fluctuates from the surface in late spring to about 50 cm deep by mid-summer. Adjacent sideslope vegetation types are: ponderosa pine/big sagebrush/Idaho fescue-bluebunch wheatgrass, ponderosa pine/elk sedge, grand fir/pinegrass, big sagebrush/Idaho fescue-bluebunch wheatgrass and lodgepole pine communities.

False Hellabore Plant Community

Veratrum spp. FW5121
VERAT n=1

This community has been described for central Oregon, Nevada and Utah and southeastern Wyoming (Kovalchik 1987, Manning and Padgett 1995, Padgett and others 1989) as a California false hellabore community type. Because of the difficulty in identifying the species of hellabore (both *Veratrum californicum* and *Veratrum viride* grow in the Blue Mountains), it is presented simply as the false hellabore community. This community occurs somewhat frequently in the Blue and Wallowa Mountains where heavy grazing of meadows has occurred. The potential vegetation on these sites is often the tufted hairgrass association. Herbaceous species present in addition to abundant false hellabore (VERAT) include American bistort (POBI), western blue flag (IRMI), tufted hairgrass (DECE), Nebraska sedge (CANE), and Baltic rush (JUBA).

Thin Bentgrass Plant Community Type

Agrostis diegoensis
AGDI n=4

This community type appears to be the result of heavy grazing on drier tufted hairgrass meadows. In Hall's (1973) Plant Communities of the Blue Mountains classification there is a moist meadow community that would correspond to the thin bentgrass association of this classification. It contains abundant thin bentgrass (10-40%). The thin bentgrass community type occurs in low to moderate gradient (1-5%), narrow to wide, trough-shaped meadows that are generally in the headwaters of the drainage basin. The side slopes are low gradient. Streams found in these meadows were 1-15 ft. wide F4 and F6 Rosgen stream types with no organic debris affecting the channel. They were probably C4 or E4 stream types before they were degraded. Rehabilitation of these sites may be possible if they are rested from grazing for several years (10 or more?). In addition to the thin bentgrass (AGDI) (cover ranges from 12-55%), many "increaser" species are present including Colorado rush (JUCO), Baltic rush (JUBA), fowl bluegrass (POPA), common timothy (PHPR), Gairdner's yampah (PEGA2), Douglas' brodiaea (BRDO), common dandelion (TAOF), yarrow (ACMI), and long-leaved aster (ASCH). Only two soils were sampled. They are Mollisols (Haploudoll and Argiudoll). The water table is well below the rooting zone by late spring. Adjacent vegetation types are: terraces - ponderosa pine/common snowberry, low sagebrush/Sandberg's bluegrass, big sagebrush/elk sedge, tufted hairgrass; sideslopes - ponderosa pine/big sagebrush/elk sedge, big sagebrush/elk sedge, Douglas-fir/elk sedge and low sagebrush/Sandberg's bluegrass.

Common Cattail Plant Community Type

Typha latifolia

TYLA n=1

One site was sampled among the mine tailings above Phillips Reservoir on Baker RD (Wallowa-Whitman NF). Common cattail communities occur only sporadically on National Forest land in the Blue Mountains. They are more common on adjacent lands at lower elevations. Sites are permanently or semi-permanently flooded wetlands with water depths of 10 or more cm. Common cattail (TYLA) forms a dense stand with few other species present. Duckweed (LEMI) and white water buttercup (RAAQ) were growing in the water in the plot sampled. Soils are Saprists or Hemists that are 20+ cm deep. This type has been described for eastern Washington, Montana, Utah, eastern Idaho, and western Wyoming (Kovalchik 1992, Hansen and others 1995, Padgett and others 1989, Youngblood and others 1985).

Meadow Foxtail Plant Community Type

Alopechurus pratensis

ALPR n=5

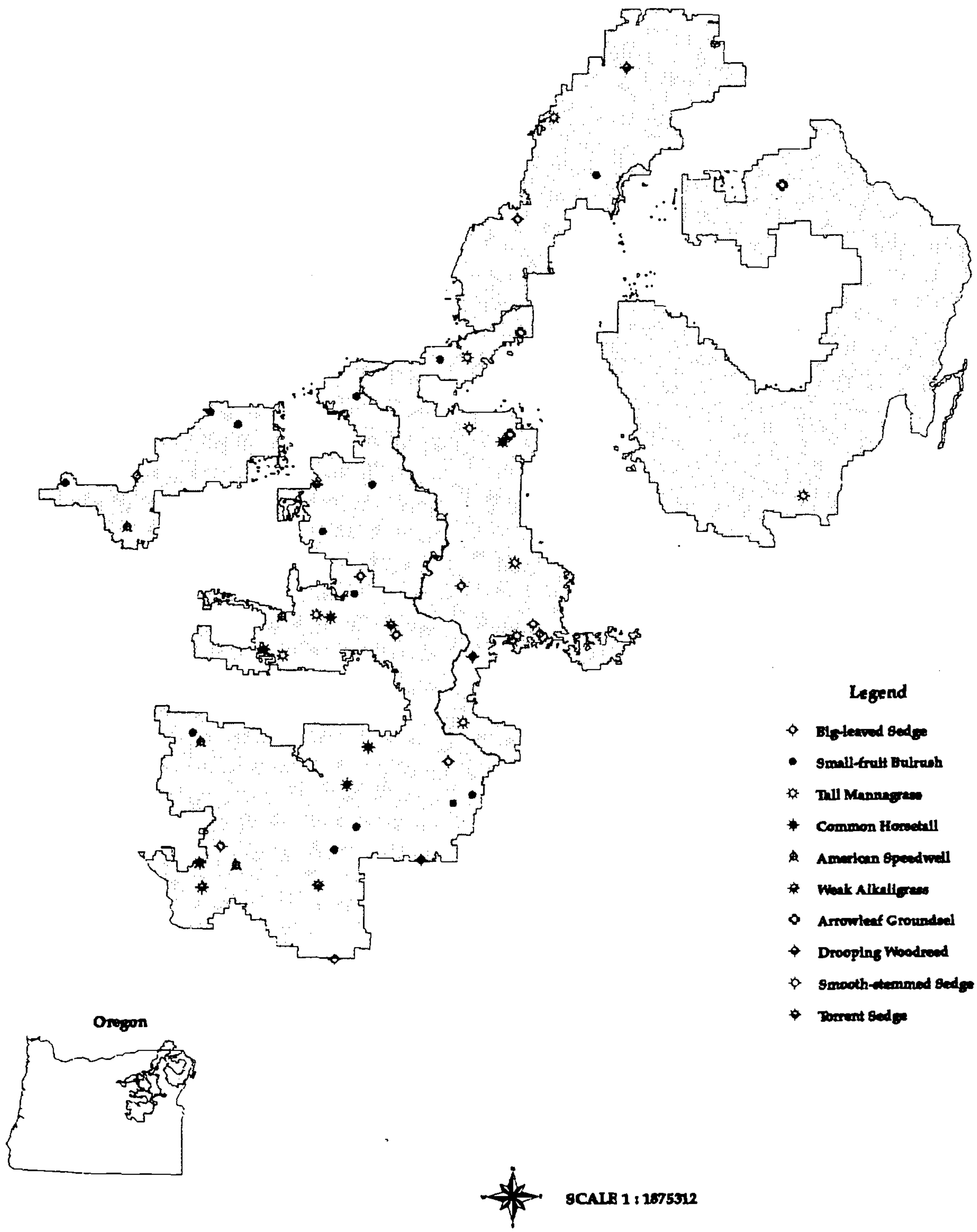
Meadow foxtail communities are seeded meadows that appear to once have been occupied by tufted hairgrass associations. Restoration of the site potential may be difficult. Sites were sampled on Long Creek, and Prairie City RDs (Malheur NF) and Heppner and Pomeroy RDs (Umatilla NF) at moderate elevations (4000-5320 ft.). Meadows are narrow to wide with low gradients and usually gentle side slopes. Soils are Mollisols. Where streams are present, reach types are B6 and E6. Meadow foxtail (ALPR) is the dominant herbaceous species with various "increaser" forbs and graminoids and some traces of tufted hairgrass (DECE) on the sites. Other herbaceous species include yarrow (ACMI), Northwest cinquefoil (POGR), American bistort (POBI), bearded wheatgrass (AGCA), Kentucky bluegrass (POPR), and small-winged sedge (CAMI). Adjacent sideslope vegetation types are: lodgepole pine - grand fir - western larch - ponderosa pine seral communities (potential vegetation is grand fir associations).

Figure 80. Facing page
Sample sites for herbaceous types on shaded streams and springs. This map does not represent the actual distribution of these herbaceous types.

Herbaceous Plant Associations

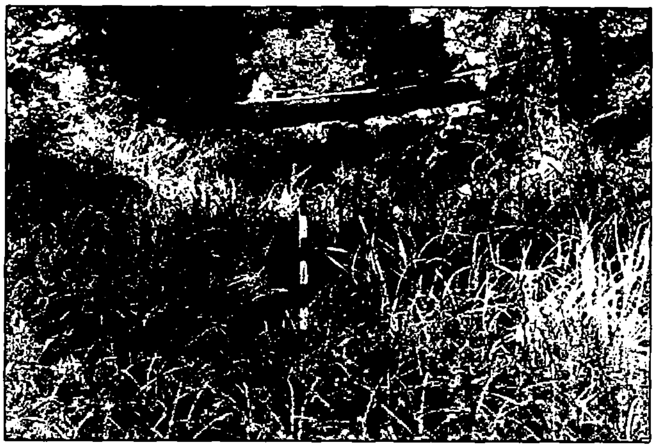
Community Types & Communities

Shaded Streams and Springs



Big-leaved Sedge Plant Association

Carex amplifolia MM2921
CAAM n=12



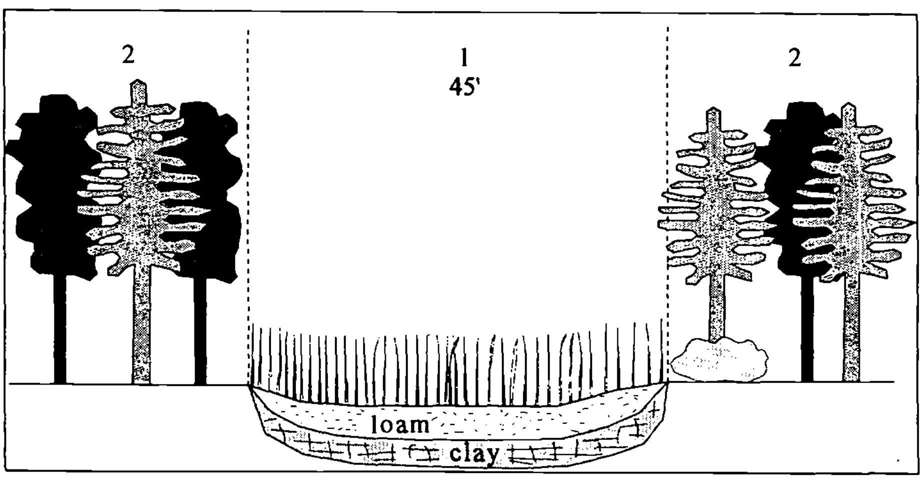
PHYSICAL ENVIRONMENT

The CAAM association was sampled at moderate elevations throughout the Blue Mountains (Prairie City, Burns and Long Creek RDs, Malheur NF; Heppner and Walla Walla RDs, Umatilla NF; Baker and Unity RDs, Wallowa-Whitman NF). Valleys with the CAAM type are narrow (16-65 ft.), low to high gradient (1-10%) and V- or trough-shaped with gentle to steep side slopes. CAAM 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	Mean	S.D.
Elevation (ft.)	4735	822
Plot Aspect (°)	210	72
Plot Slope (%)	10	7
Valley Width (m)	15	20
Valley Gradient (%)	5	4
Valley Aspect (°)	177	74
Soil Surface Cover (%)		
Submerged	14	23
Bare Ground	2	5
Rock	2	3
Moss	20	27
Liverwort	3	6
Litter	48	28

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, unk. sedimentary, mixed igneous extrusive
Water Table Depth (cm)	0-48
Total Rooting Depth (cm)	12-76+
Depth to Redoximorphic Features (cm)	4-28
Surface Layer	
Thickness (cm)	5-28
Texture(s)	sapric, hemic, fibric organic, silty clay loam, silt loam
Coarse Fragments (%)	0
Roots	very fine: many; fine: many; medium: few to common; coarse: none to many
Redoximorphic Features	none
Subsurface Layer(s)	
Thickness (cm)	18-66
Texture(s)	sapric, hemic organic silty clay loam, silt loam, sandy loam, sand
Coarse Fragments (%)	0-30, gravel, cobble



1 **Big-leaved sedge**, spring - on north-facing sideslope

2 Douglas fir-ponderosa pine, surrounding vegetation

Figure 81. *Government Spring, Heppner RD, Umatilla NF; mod. elevation spring; Xeric Central Highlands*

Roots	very fine: none to many	fine: none to common
	medium: none to few	coarse: none to few
Redoximorphic Features		some iron oxidation
Substrate		gravel, clay

VEGETATION COMPOSITION

Big-leaved sedge 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, common willow-herb, American speedwell, white bog-orchid, large-leaf avens, and violets. Vegetation types surrounding sites sampled are: Douglas-fir/common snowberry, ponderosa pine/common snowberry, lodgepole pine-western larch, 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 occasional subalpine fir associations.

Principal Species		**Con**	**Cov**
Sedges and Rushes			
CAAM	Big-leaved sedge	100	58
JUEN	Sword-leaf rush	67	5
SCMI	Small-fruit bulrush	58	11
Perennial Grasses			
GLEL	Tall mannagrass	83	19
Perennial Forbs			
MIGU	Common monkey-flower	58	4
EPGL2	Common willow-herb	58	4
VEAM	American speedwell	42	4

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 667 to 2800 (avg. 1728) lbs/acre. This association usually does not occupy a large area (approx. 50-300 sq. meters) and therefore would not provide much forage for livestock. Sites are seldom grazed by large animals because of the wet soils and low palatability of big-leaved sedge. These sites are probably good water sources for many wildlife species and may provide good habitat for amphibians if woody debris is available on the site. The CAAM association probably has a very infrequent fire interval due to high moisture.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Semi-permanently Flooded.

OTHER STUDIES

Kovalchik (1987) described a small-fruit bulrush - (bigleaf sedge potential) association for central Oregon. It includes bigleaf sedge communities but generally occurs on active fluvial surfaces rather than in springs.

Small-fruit Bulrush Plant Association

Scirpus microcarpus	MM2924
SCMI	n=17

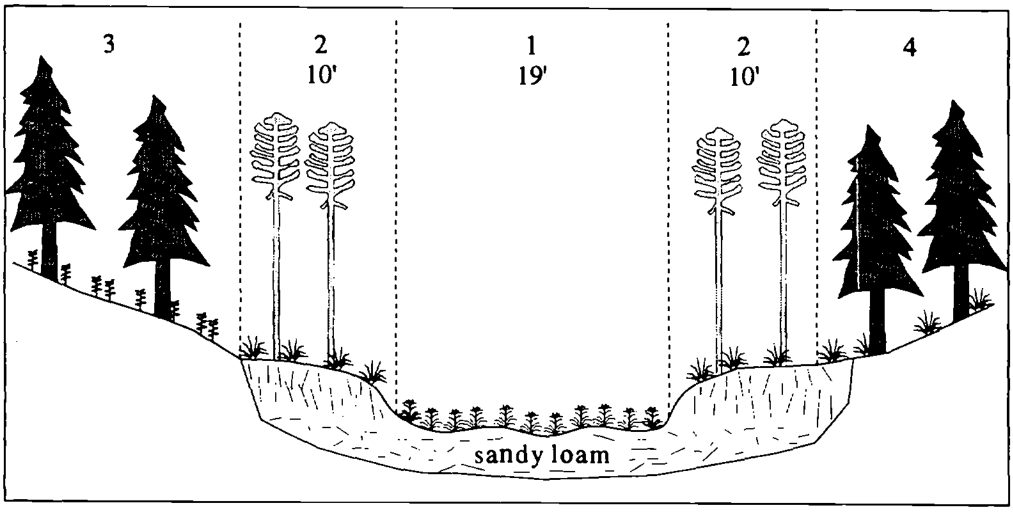
PHYSICAL ENVIRONMENT

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 (Wallowa-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.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4830	466
Plot Aspect (°)	140	60
Plot Slope (%)	5	6
Valley Width (m)	47	51
Valley Gradient (%)	3	3
Valley Aspect (°)	127	65
Soil Surface Cover (%)		
Submerged	5	6
Bare Ground	8	12
Moss	16	20
Litter	45	40

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, rhyolite, andesite
Water Table Depth (cm)	0-61
Total Rooting Depth (cm)	18-79
Depth to Redoximorphic Features (cm)	5-30
Surface Layer	
Thickness (cm)	5-36
Texture(s)	silt loam, organic loam, silty clay loam, loam, silty clay
Coarse Fragments (%)	0-70, gravel
Roots	very fine: common to many; fine: few to many; medium: few to many; coarse: none to few
Redoximorphic Features	none



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

Figure 82. *Trib. To Middle Fk. Wolf Creek, Burns RD, Malheur NF; mod. gradient, mod. high elevation, V-shaped valley; Continental Zone*

Subsurface Layer(s)

Thickness (cm)	8-55
Texture(s)	fine to medium sandy loam, silt loam loam, silty clay loam
Coarse Fragments (%)	0-90, gravel
Roots	very fine: common to many; fine: few to many; medium: few to many; coarse: none to few
Redoximorphic Features	common iron oxidation, gleying

Substrate gravel, cobble, clay

VEGETATION COMPOSITION

Small-fruit bulrush cover ranges from 25-100%. Scattered graminoids and forbs include large-leaf avens, yarrow, American speedwell, violets, common monkey-flower, white bog-orchid, field mint, western polemonium, buttercups, bluegrasses, and mannagrasses. Forbs are more abundant on active floodplains than in meadows or springs. Vegetation types adjacent to sites sampled are: terraces - Engelmann spruce/grouse huckleberry, lodgepole pine/pinegrass, grand fir/Pacific yew/queen's cup beadlily, other spruce communities; sideslopes - subalpine fir/big huckleberry, grand fir/ twinflower, grand fir/Pacific yew/queen's cup beadlily and other lodgepole pine and grand fir communities.

Principal Species		**Con**	**Cov**
Sedges and Rushes			
SCMI	Small-fruit bulrush	100	58
JUEN	Sword-leaf rush	59	2
CAMI	Small-winged sedge	53	7
Perennial Grasses			
GLEL	Tall mannagrass	53	6
Perennial Forbs			
GEMA	Large-leaf avens	59	7
ACMI	Yarrow	47	4

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 500 to 2967 (avg. 1764) lbs/acre. Small-fruit bulrush does not appear to be very palatable to livestock or wild ungulates. Little grazing of this association was seen.

The well-developed creeping rhizomes of small-fruit bulrush allow it to survive low to moderate intensity fires. Hot fires on a dry substrate may kill the rhizomes. Care should be taken not to kill small-fruit bulrush plants on floodplains and streambanks since they provide good erosion control.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Seasonally Flooded.

OTHER STUDIES

Kovalchik (1987) described a small-fruit bulrush (bigleaf sedge potential) association for central Oregon that is essentially equivalent to this association. Diaz and Mellon (1996) describe a SCMI association for northwestern Oregon/southwestern Washington.

Tall Mannagrass Plant Association

Glyceria elata MM2925
GLEL n=10

PHYSICAL ENVIRONMENT

The GLEL association was sampled at moderate elevations (2860-5900 ft.) on Long Creek and Prairie City RDs (Malheur NF); Walla Walla and Pomeroy RDs (Umatilla NF); and Unity, Baker, and La Grande RDs (Wallowa-Whitman NF). It is found in 16-500 ft. wide, low to high gradient (2-10%), V- and trough-shaped valleys with moderately steep to steep side slopes. Sites are gravel bars, streambanks, floodplains, and springs. Adjacent stream reach types are B2, B3, B4, and C4. Stream widths are 1-15 ft. wide. Woody debris affects from 10-30% of the active channel. Soils are Entisols (Mollic and Typic Endoaquents), Mollisols (Typic Endoaquolls), Inceptisols (Histic Humaquepts), and one Histisol (Fluvaquentic Borohemist). Soils are shallow to deep fine-textured material over water-worked gravel and cobbles of buried stream beds. Four plots are alluvial bars with at least 80% coarse fragment content in the surface layer. Sites are generally flooded during spring runoff, but the water table drops to 20-50 cm below the soil surface by mid-summer.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4402	822
Plot Aspect (°)	25	78
Plot Slope (%)	8	15
Valley Width (m)	49	59
Valley Gradient (%)	5	3
Valley Aspect (°)	202	74
Soil Surface Cover (%)		
Submerged	6	8
Bare Ground	1	1
Gravel	6	14
Rock	8	15
Moss	22	30
Liverwort	10	20
Litter	47	36

Soil Profile Characteristics

Bedrock/Parent Material(s)	basalt, andesite, sedimentary
Water Table Depth (cm)	18-53
Total Rooting Depth (cm)	10-48
Depth to Redoximorphic Features (cm)	8

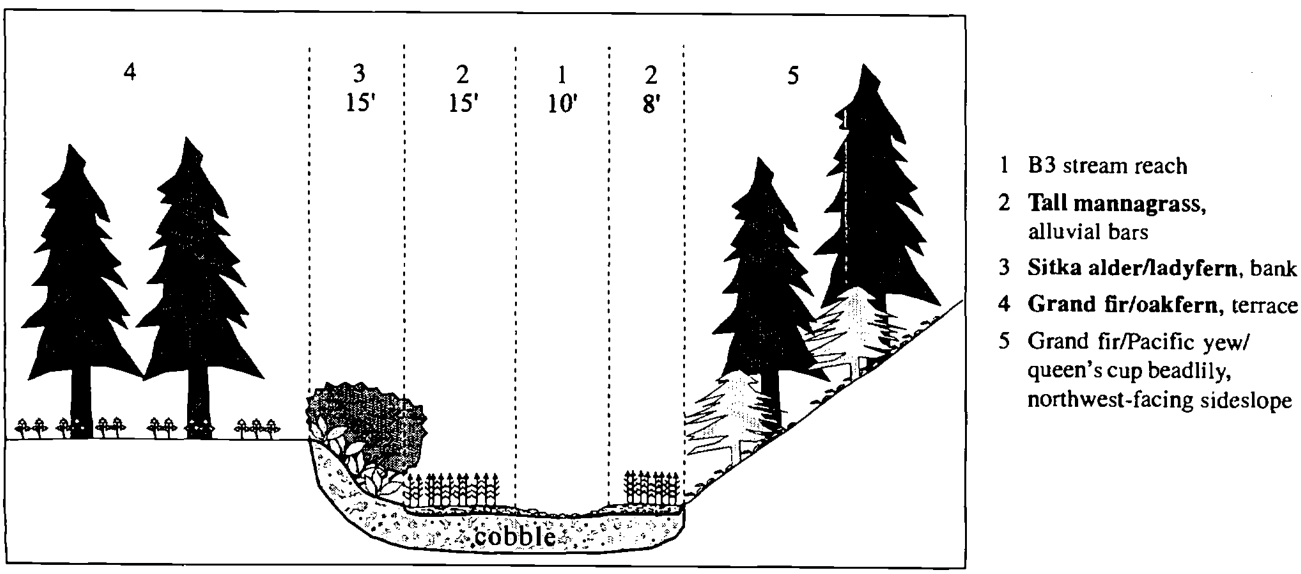


Figure 83. *Touchet River, Pomeroy RD, Umatilla NF; mod. low gradient, mod. elevation, V-shaped valley; Mesic Forest Zone 2.*

Surface Layer

Thickness (cm)	8-20
Texture(s)	silt loam, fine sandy loam
Coarse Fragments (%)	0-70, gravel
Roots very fine: common to many	fine: many
medium: none to few	coarse: none to common
Redoximorphic Features	none

Subsurface Layer(s)

Thickness (cm)	3-40
Texture(s)	fine sandy loam, loam, silt loam
Coarse Fragments (%)	0-55, gravel, cobble
Roots very fine: none	fine: none to common
medium: none to few	coarse: none
Redoximorphic Features	some iron oxidation

Substrate sandy loam, gravel

VEGETATION COMPOSITION

Tall mannagrass cover ranges from 10-70% over a rich mixture of graminoids and forbs including drooping woodreed, American mannagrass, common timothy, Kentucky bluegrass, Dewey's sedge, sword-leaf rush, small-fruit bulrush, soft-leaved sedge, American speedwell, common willow-herb, large-leaf avens, common monkey-flower, and enchanter's nightshade. Vegetation types adjacent to sample sites are: 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.

Principal Species		**Con**	**Cov**
Shrubs			
RIHU	Stinking currant	70	5
Perennial Grasses			
GLEL	Tall mannagrass	100	39
CILA2	Drooping woodreed	40	4
Perennial Forbs			
VEAM	American speedwell	90	3
GEMA	Large-leaf avens	70	2
EPGL2	Common willow-herb	70	1
MIMO	Musk monkey-flower	60	2
MIGU	Common monkey-flower	60	2
PRVU	Common self-heal	50	2
GATR	Sweet-scented bedstraw	50	1
CIAL	Enchanter's nightshade	60	2
FRVE	Woods strawberry	50	1
SAAR4	Brook saxifrage	40	6
Sedges and Rushes			
CADE	Dewey's sedge	40	16
Ferns and Horsetails			
ATFI	Ladyfern	40	24
EQAR	Common horsetail	40	17

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 366 to 2200 (avg. 1076) lbs/acre. Tall mannagrass is nutritious forage for livestock and wild ungulates. The wet soils and small size of these sites, however, make them unsuitable for grazing in most locations.

The rhizomatous growth form and high moisture content of tall mannagrass probably allows it to survive most fires.

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Seasonally Flooded.

OTHER STUDIES

The GLEL association has been described as a miscellaneous type for eastern Washington by Kovalchik (1992). Diaz and Mellon (1996) described a common monkey flower plant association that is somewhat similar the GLEL type.

Common Horsetail Plant Association

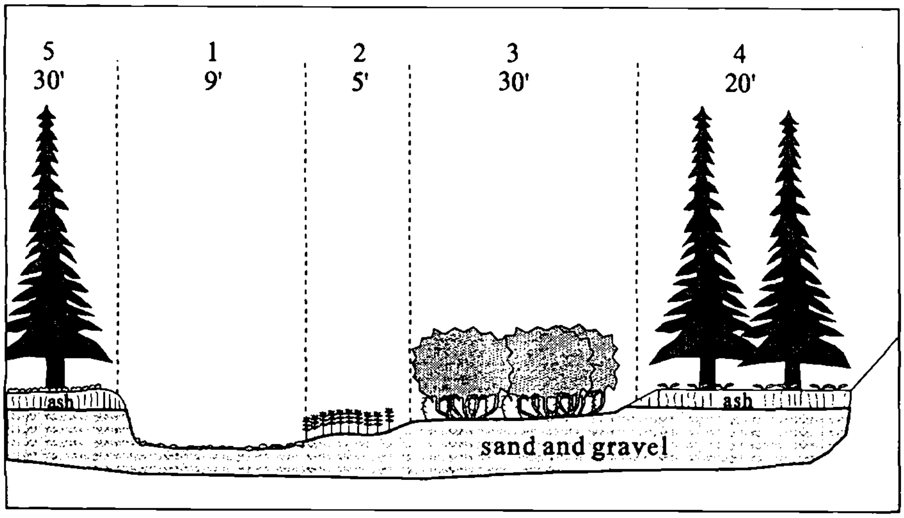
Equisetum arvense FW4212
EQAR n=5

PHYSICAL ENVIRONMENT

The EQAR association was sampled at moderate to high elevations (3820-6340 ft.) on Long Creek, Prairie City, and Bear Valley RDs (Malheur NF) and La Grande RD (Wallowa-Whitman NF). Valleys in which EQAR occurs are 30-300 ft. wide, low to moderate gradient (1-5%), and V-shaped with gentle to moderately steep side slopes. All sites are cobbly and/or gravelly alluvial bars adjacent to B2, B3, B4 or C4, 5-30 ft. wide stream reach types with no organic debris affecting the stream channel. Soils are sandy-skeletal Entisols. The sites are flooded during spring runoff and the water table remains within 30 cm of the soil surface.

Valley Environment	**Mean**	**S.D.**
Elevation (ft.)	4904	960
Plot Aspect (°)	296	74
Plot Slope (%)	3	3
Valley Width (m)	56	20
Valley Gradient (%)	2	1
Valley Aspect (°)	1	77
Soil Surface Cover (%)		
Submerged	24	32
Bare Ground	3	3
Gravel	19	40
Rock	46	44
Moss	7	16
Liverwort	1	3
Litter	1	1

Soil Profile Characteristics	
Bedrock/Parent Material(s)	basalt, andesite
Water Table Depth (cm)	10+
Total Rooting Depth (cm)	10-48
Depth to Redoximorphic Features (cm)	8+
Surface Layer	none
Subsurface Layer(s)	none
Substrate	gravel cobble



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

Figure 84. *N. Fk. Cable Creek, North Fork John Day RD, Umatilla NF; mod. low gradient, mod. elevation, V-shaped valley; Mesic Forest Zone 1.*

VEGETATION COMPOSITION

Common horsetail cover ranges from 10-75%. Other forbs and graminoids are scattered amongst the horsetail, usually at low coverage. Field mint, curly dock, spike bentgrass, and common monkey-flower are occasionally abundant. Vegetation types adjacent to sites sampled are: terraces - black cottonwood/common snowberry, ponderosa pine/common snowberry, lodgepole pine-western larch subalpine fir/queen's cup bead lily, subalpine fir/twinflower; sideslopes - Engelmann spruce-subalpine fir, lodgepole pine (grand fir)/grouse huckleberry/pinegrass and ponderosa pine/common snowberry.

Principal Species		**Con**	**Cov**
Ferns and Horsetails			
EQAR	Common horsetail	100	49
Perennial Forbs			
MEAR3	Field mint	60	15
MIGU	Common monkey-flower	60	5
EPGL2	Common willow-herb	60	1
Perennial Grasses			
GLEL	Tall mannagrass	80	5
AGDI	Spike bentgrass	40	6
PHPR	Common timothy	40	1
Sedges and Rushes			
CALEL2	Densely-tufted sedge	40	2
JUEN	Sword-leaf rush	40	1

MANAGEMENT CONSIDERATIONS

Total dry herbaceous biomass ranged from 1000 to 3248 (avg. 1718) lbs/acre. Common horsetail is not an important forage species for domestic livestock and it is low in palatability to deer and elk. It is a minor to important component in the spring and early summer diet of black bears (Sullivan 1993).

Fire is probably infrequent in this moist to wet association. Above ground plant parts of common horsetail are killed by most fires. The rhizomes are very deep (down to 6 ft. or deeper) and are not killed by even very hot fires. Common horsetail regenerates rapidly following fires and its abundance is usually unchanged or increased (Sullivan 1993). Its rhizomatous growth form makes it a good stabilizer of coarse stream sediments.

Cover for wildlife by common horsetail is fair to poor (Sullivan 1993).

USDI FISH AND WILDLIFE SERVICE WETLANDS CLASSIFICATION

SYSTEM Palustrine, CLASS Emergent, SUBCLASS Persistent, WATER REGIME (NONTIDAL) Seasonally Flooded.

OTHER STUDIES

Diaz and Mellon (1996) described an EQAR plant association.

Miscellaneous Herbaceous Types
Streams and Springs

Smooth-stemmed Sedge Plant Community

Carex laeviculmis
CALA n=1

This community was sampled on a floodplain on Dry Fork Beaver Creek on La Grande RD (Wallowa-Whitman NF). Smooth-stemmed sedge (CALA) forms a dense stand with a rich mixture of forbs and graminoids growing throughout the site, including swamp onion (ALVA), common cowparsnip (HELA), western polemonium (POOC), arrowleaf groundsel (SETR), small-winged sedge (CAMI), tall mannagrass (GLEL), and Thurber bentgrass (AGTH). The soil is very moist throughout the year. The stream is a narrow, moderate gradient C5 Rosgen stream type. Adjacent upland vegetation is grand fir/grouse huckleberry and grand fir/ twinflower (upper slopes).

Torrent Sedge Plant Community Type

Carex nudata MM2922
CANE4 n= 2

Two sites were sampled on the John Day River: one on the Middle Fork in Long Creek RD and one on the North Fork in North Fork John Day RD (Umatilla NF). This community is abundant along these forks of the John Day River and also along Camas Creek, which is a tributary of the North Fork. Sites are bouldery stream banks and narrow alluvial bars adjacent to the banks of C-type streams. Torrent sedge (CANU4) forms a dense (88-92% cover) carpet. Straight-leaved rush (JUOR), creeping bentgrass (AGST), field mint (MEAR3), springbank clover (TRWO2), and willow-herbs (EPILO) 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. The drooping leaves provide excellent fish hiding cover. Adjacent upland vegetation types are: Douglas-fir/ common snowberry, Douglas-fir/elk sedge, Douglas-fir/ mallow ninebark and ponderosa pine/elk sedge.

Weak Alkaligrass Plant Association

Puccinellia pauciflora
PUPA n=3

Three sites were sampled at moderate elevations (4620-5300 ft.) in trough- and U-shaped, low to moderate gradient, 30-300 ft. wide valleys. Fluvial surfaces were a stream bottom, a wet basin, and streambanks. Stream reach types were very narrow C6, F6 and G5's. Weak alkaligrass (PUPA) is abundant (60-70%) with few other herbaceous species present, including common monkey-flower (MIGU), common willow-herb (EPGL2), American speedwell (VEAM), Baltic rush (JUBA), sword-leaf rush (JUEN), and creeping spikerush (ELPA). Sites are submerged or saturated throughout the growing season, and soils are deep and fine-textured. Adjacent vegetation types are: terraces - big sagebrush/Cusick's bluegrass, ponderosa pine/common snowberry; sideslopes - ponderosa pine/big sagebrush/elk sedge, ponderosa pine/ common snowberry and big sagebrush/elk sedge.

Drooping Woodreed Plant Community

Cinna latifolia
CILA2 n= 1

One alluvial bar with abundant drooping woodreed (CILA2), cool-wort foamflower (TITRU), crisped starwort (STCR), and common willow-herb (EPGL2) was sampled on Pomeroy RD (Umatilla NF). The adjacent stream is a B4 Rosgen stream type in a narrow valley. This community may be successional to the RIBES/CILA2 association. Adjacent sideslope vegetation was grand fir/big huckleberry.

Arrowleaf Groundsel Plant Association

Senecio triangularis FW4211
SETR n=3

This miscellaneous type has been described as an association for central Oregon by Kovalchik (1987) and was sampled on La Grande and Wallowa Valley RDs (Wallowa-Whitman NF). Sites are alluvial bars or streambanks capped by a thin silt loam layer adjacent to 1-15 ft. wide A3, B5 and C4 stream reach types. These sites are frequently flooded and have a lot of bare ground and surface gravel and cobble. Arrowleaf groundsel (SETR) is abundant (25-80% cover) with a variety of other herbaceous species scattered through the sites, including stream buttercup (RAUN2), western meadowrue (THOC), large-leaf avens (GEMA), heart-leaf arnica (ARCO), tall mannagrass (GLEL), and soft-leaved sedge (CADI). Adjacent sideslope vegetation types are: grand fir/oakfern, grand fir/queen's cup beadlily, subalpine fir/queen's cup beadlily and subalpine fir/twinflower. Kovalchik (1987) described a SETR plant association. Diaz and Mellon (1996) describe a similar SETR-ASMO plant community for northwestern Oregon/southwestern Oregon.

American Speedwell Plant Association

Veronica americana

VEAM n=5

The american speedwell plant association occurs on channel shelves (alluvial bars parallel to the banks) in high gradient, narrow V-shaped valleys. Soils are usually saturated for most or all of the growing season and are generally very coarse fragment-rich. Stream reach types for sites sampled are A4, E5 and G5. Channels are 1 to 15 ft. wide with organic debris affecting 10-30% of the active channel. American speedwell coverage is high with abundant common monkeyflower (MIGU), fowl bluegrass (POPA), common willow-weed (EPGL2), brook saxifrage (SAAR4), spike bentgrass (AGDI) and/or alpine mitrewort (MIPE). This type is similar to the common monkey flower association described by Diaz and Mellon (1996). Adjacent sideslope vegetation types are: grand fir/twinflower, grand fir/Pacific yew/twinflower, grand fir/grouse huckleberry and other grand fir associations.

Maidenhair Fern Plant Community Type

Adiantum pedatum FW4213

ADPE n=2

Two sites was sampled on the streambanks of West Fork Little Indian Creek on Prairie City RD (Malheur NF) and on a tributary to North Fork Umatilla River (Walla Walla RD (Umatilla NF). This community is abundant along tributaries to Indian Creek in the Strawberry Mtns. Wilderness (Malheur NF). Maidenhair fern (ADPE) forms a dense herbaceous layer with blue wildrye (ELGL) abundant throughout the site. Adjacent stream reaches are A4 and B3 in narrow, steep gradient valleys. The streambanks are flooded during spring runoff and the water table is probably fairly shallow throughout the growing season. Diaz and Mellon (1996) described the ADPE plant association for northwestern Oregon/southwestern Washington.

Brook Saxifrage Plant Community Type

Saxifraga arguta

SAAR4 n= 3

Three sites were sampled on Prairie City RD (Malheur NF) and Baker and La Grande RDs (Wallowa-Whitman NF). One site is the floodplain of a narrow, high gradient, braided (Rosgen D6 type) stream at high elevation (6530 ft.). The other sites are high elevation springs. All sites are very wet throughout the growing season with 10-20 cm of fine-textured sediment over the cobbly subsoil. Brook saxifrage (SAAR4) is abundant with various wet forbs and graminoids scattered through the site at low cover, including alpine mitrewort (MIPE), common willow-herb (EPGL2), arrowleaf groundsel (SETR), stream buttercup (RAUN2), tall mannagrass (GLEL), slender muhly (MUFI), sword-leaf rush (JUEN), and small-flowered woodrush (LUPA). Adjacent upland vegetation types are subalpine associations. Diaz and Mellon's (1996) SAAR4-SETR plant association for Mt. Hood NF is similar to this type.

Swamp Onion Plant Community Type

Allium validum

ALVA n=3

Three sites were sampled to typify this type: all were on the Wallowa Whitman NF (Baker and Eagle Cap RDS). This community type commonly occurs at high elevations throughout the Eagle Caps, Elkhorns and Strawberry Mountains. Elevations of sampled sites ranged from 7120 to 7160 ft. Generally the swamp onion community type occurs on seeps or adjacent to Holm's sedge communities in small headwater basin meadows but can also be found on floodplains or streambanks adjacent to narrow steep (A type) to low gradient (E type) stream reaches. Adjacent upland vegetation is subalpine fir associations. The upland vegetation may be early to mid seral stages dominated by lodgepole pine and or western larch. Sites are dominated by swamp onion (ALVA) with a variety of forbs and graminoids scattered throughout, including brook saxifrage (SAAR4), Rocky Mountain grass-of-Parnassus (PAFI), Jeffrey's and alpine shooting star (DOJE, DOAL), marsh-marigold (CABI), subalpine daisy (ERPEC), tufted hairgrass (DECE) and Holm's sedge (CASC5). Soils consist of silt loam or fibric organic material and are usually saturated through the middle of the growing season.

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APPENDIX A. GLOSSARY

(Adapted from Kovalchik 1987)

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 at most occasionally, as scattered individuals in an association; often as a random or chance occurrence.

Alluvial bar. A deposit formed on the inside of a stream meander where the stream capacity to transport material is diminished. Deposits can consist of silt to boulder-sized particles.

Alluvium. Sediments deposited on land by streams and rivers.

Alpine. The area above the upper limits of (erect) tree growth.

Anaerobic. A condition characterized by the absence of free oxygen.

Aquatic ecosystem. The stream channel or lake bed, the water, and the vegetative communities associated with them, forming an interacting system.

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. Classes include:

Low	0 - 0.12
Moderate	0.13 - 0.17
High	0.17 +

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.

Bar. An elongated landform formed by waves and currents, usually running parallel to the shore, composed predominantly of unconsolidated sand, gravel, stones, cobbles, or rubble and with water on two sides.

Basal area. The area of the cross-section of a tree trunk 4.5 feet above the ground, usually expressed as the sum of tree basal areas in square feet per acre.

Basin. A depression or hollow in the land, surface surrounded by higher ground.

Bog. A soil/vegetation complex in which the lower parts are dead peat, gradually changing upwards to living plant tissues. Usually saturated, relatively acid, 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.

Boulders. Rock fragments greater than 25.4 cm (10 inches) in diameter.

Browse. Shrubby or woody forage utilized especially by big game.

Caespitose (also spelled cespitose). A plant growing in dense tufts. Roots are a mass growing from individual stems or from a loose crown.

Canopy cover. The 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.

Canyon. A long, deep, narrow, very steep sided valley with high and precipitous walls in an area of high local relief.

Carr. Alder and/or willow dominated riparian sites. Peat and/or other mosses are sometimes present. The water table is usually near the surface most of the year and there is little or no accumulation of peat. Also, called shrub carr.

Caudex. A short, more or less vertical, often woody, persistent stem at or just beneath the surface of the ground. It serves as the perennating organ from which new aerial stems arise each year. A caudex may surmount a taproot or produce adventitous roots like a rhizome.

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. Rock fragments less than 0.002 mm in diameter.

Climax. Climax has been defined as the kind of plant community that will come to occupy a site under existing hydrology (flooding regime and mean annual water table depth ranges), soils (parent material, particle size, chemistry), microclimate and fluvial surface. 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. The plant association is the climax plant community on a site.

Climax species. A species that is self regenerating, in the absence of change in the hydrology, soils and microclimate (see above definition) with no evidence of replacement by other species.

Cobbles. Rock fragments 7.6 cm (3 inches) to 25.4 cm (10 inches) in diameter.

Cold air drainage. Valley in which cold air accumulates in bottom, generally because of some type of physical constriction of valley sideslopes at lower end of valley. Cold air accumulates in bottom of valley because it is heavier than warm air.

Colluvial. Pertaining to material transported and deposited by gravitational action and local unconcentrated runoff on and at the base of steep slopes.

Colluvium. Unconsolidated earth material deposited on and at the base of steep slopes by direct gravitational action and local unconcentrated runoff.

Common. When relating to plant coverageany species having a canopy coverage of 5 percent or more in a stand.

Constancy. The percentage occurrence of a species within an association with no emphasis provided for either size or numbers.

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 of species in a community, and their relative abundances, per unit area or volume.

Dominant. The species controlling the environment.

Ecological status. The degree of departure of the current vegetation from climax. 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:

Climax/Late Seral
Mid Seral
Early Seral

Ecosystem. A complete interacting system of organisms and their environment.

Ecotone. A boundary between adjacent plant communities.

Edaphic. Due to soil or topography rather than general climate.

Emergent vegetation. Dominated by erect, rooted, herbaceous angiosperms which may be temporarily to permanently flooded at the base but do not tolerate prolonged inundation of the entire plant.

Entisol. Those soils that have little or no evidence of pedogenic horizons, normally, as a result of recent deposition by fluvial action, entisols encountered during this study belong to the Cryofluvent subgroup.

Ephemeral stream. A stream, or reach of a stream, that flows for only part of the year, generally coinciding with contributions from melting snow or seasonal subsurface sources.

Erosion. The wearing away of the land surface by running water, waves, moving ice and wind, or by such processes as mass wasting and corrosion.

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. Usually circumneutral and mineral-rich. Intergrades with bog and marsh.

Floodplain. The nearly level alluvial plain that borders a stream. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of the stream.

Flood storage. The process by which peak flows (from precipitation, runoff, groundwater discharge, etc.) enter a wetland and are delayed in their downslope 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 active and inactive floodplains, active channel shelves, streambanks, and overflow channels.

Foothills. A steeply sloping upland with hill relief (up to 1000 ft) that fringes a mountain range or high plateau escarpment.

Forage condition. An ecological concept used to interpret livestock grazing impacts on vegetation. The departure from potential under existing environmental conditions assuming a causal relationship between the vegetation and domestic ungulate grazing.

Forage (herbage) production. The aboveground biomass (air dried pounds per acre) of all grasses, sedges, and forbs; no allowance is made for proper use factors.

Foraging/feeding. Providing habitat for collection or consumption of food, gravel, or necessities for nutrition.

Forb. Any herbaceous plant, usually broad-leafed, that is not a grass or grasslike plant.

Forested vegetation. Dominated by woody vegetation 6 meters (20 feet) or more in height.

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.

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 and unstratified glacial drift, generally unconsolidated, deposited directly by a glacier without subsequent reworking by water from the glacier.

Gleyed soils. Soils having a intense reduction of iron during soil development, or reducing conditions due to stagnant water, as indicated by base colors that approach neutral (blueish, grayish, or greenish), with or without mottles. In the more extreme condition, ferrous iron is present.

Gradient (valley gradient). The slope of the valley floor in percent:

Very Low	Less than 1 percent
Low	1-3 percent
Moderate	4-5 percent.
High	6-8 percent
Very high	Greater than 8 percent

Graminoid. Grass or grasslike plant, such as bluegrass (*Poa*), sedge (*Carex*), and rush (*Juncus)* species.

Gravel. A mixture composed primarily of rock fragments 2 mm (0.08 inch) to 7.6 cm (3 inches) in diameter. Usually contains much sand.

Groundwater. Subsurface water in porous strata within the zone of saturation.

Growing season. The frost free period of the year (see U.S. Department of Interior, National Atlas 1970:110-111 for generalized regional delineation).

Habitat type. All the land capable of producing similar plant communities at climax.

Herbaceous. Non-woody vegetation, such as grasses and forbs.

Herbage production. See forage production.

Histosol. Soils that contain a surface horizon of organic matter that is at least 40 cm (16 inches) thick. Suborders are distinguished by the degree of decomposition of organic material and the presence of moss fibers:

<u>Fibric</u> - Plant remains are so little decomposed that at least three-fourths (by volume) are not destroyed by rubbing and their botanical origin can often be determined.

<u>Hemic</u> - Organic materials are intermediate in decomposition between fibric and sapric. About one half of fibers are largely destroyed by rubbing between the fingers.

<u>Sapric</u> - 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

<u>Limnic</u> - 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.

Impounded. 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 finer than loamy sand, and altered horizons that have lost bases but retain some weatherable minerals. Surface horizons are grey to black and are high in carbon.

Indicator plant. A plant whose presence or abundance indicates certain environmental conditions--presence of a habitat type, association, or community type.

Intermittent stream. A stream, or reach of a stream, that flows for protracted periods only when it receives ground water discharge or continued contributions from melting snow or other surface and shallow subsurface sources.

Krumholtz. Trees dwarfed and twisted because of severe climate (wind, low temperature, etc.) at the high elevation limits of forest development.

Lacustrine. 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.

Low elevation. The elevation range 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. Vegetation 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. Meandering stream channels commonly have cross sections with low width to depth ratios, fine grained bank materials, and low gradient.

Moderate elevation (midmontane). A zone identified by characteristic vegetation which 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.

Mineral soil. Soil composed of predominantly mineral rather than organic materials.

Mollic epipedon. Abstraction of properties common to the soils of the steppes of America, Europe, and Asia, focuses immediate attention on the horizons at or near the surface rather than the deeper ones.

Mollisol. Soils 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 bivalent cation such as calcium.

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.

Organic loam. A generalized name for soils having more than 12 percent organic particles in addition to clay, silt, and sand.

Organic soil. Soil composed of at least 12 percent or more organic carbon if the mineral fraction contains 60% or less clay; or at least 18% organic carbon if the mineral fraction contains more than 60%. Equivalent to Histosol.

Palustrine. . Tidal and nontidal wetlands dominated by trees, shrubs, persistent emergents, 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: 1) area less than 8 hectares; 2) active wave formed or bedrock shoreline features lacking; maximum water depth less than 2 meters at low water; 3) ocean-derived salinity less than 0.5 ppt.

Peat. Unconsolidated soil material consisting largely of undercomposed or only slightly decomposed organic mater accumulated under conditions of excessive soil moisture.

<u>Moss peat</u>. Peat soil composed of partially decomposed sphagnum and/or other mosses.

<u>Sedge peat</u>. Peat soil composed of partially decomposed sedges, bulrushes, rushes, etc.

<u>Woody peat</u>. Peat soil composed of partially decomposed wood.

Perched water table. Zone of saturated soil that lies above a zone of unsaturated soil within 200 cm 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.

Pioneer plants. Herbaceous annual and seedling perennial plants that colonize bare areas as a first stage in secondary succession.

Plant association. Normal usage is a climax community type (climax plant community) (Pfister and others 1979). However, in this classification it refers to an assemblage of native riparian vegetation occurring together in equilibrium with the environment for a given fluvial surface (i.e. the potential riparian vegetation on a fluvial surface).

Plant community. An assemblage of plants occurring together at any point in time, thus denoting no particular ecological status.

Plant community type. An aggregation of all plant communities distinguished by floristic and structural similarities in both overstory and undergrowth layers. A unit of vegetation within a classification. In this classification, it is used to name naturalized riparian communities such as **Kentucky bluegrass** or obviously seral communities such as **quaking aspen/Douglas spiraea/ widefruit sedge**.

Poorly represented. When relating to plant coverage in the association descriptions, any species that is absent or has a canopy coverage of less than 5 percent.

Potential natural vegetation (PNV). Generally used to refer to the late seral/"climax" plant community that can occur on a site. This is more or less the equivalent of the plant association for a site. PNV may not be the Desired Future Condition (DFC) for a particular site. The DFC may be an earlier seral plant community.

Redoximorphic features. Zones of concentration or depletion of iron and/or manganese ions caused by saturation and desaturation of the soil by water. Concentrations can be nodules and concretions, pore linings and masses of noncemented concentrations (often referred to as mottles). Depletions are areas of low amounts of iron and/or manganese oxides or clays.

Restored. Artificially returned from a disturbed or totally altered condition, to a state which mimics the original, natural condition.

Rhizome. A creeping underground stem from which aerial stems arise.

Rhizomatous. Bearing rhizomes.

Riparian. That land, next to water, where plants dependent on a perpetual source of water occur.

Riparian wetland. An out-of-channel, palustrine wetland associated with the flowing water of a riverine system.

Riparian zone (ecosystem). The interface between aquatic and terrestrial ecosystems that is identified by the presence of vegetation that requires or tolerates free or unbound water or conditions that are more moist than normal (Franklin 1973).

Riverine. All wetlands and deepwater habitats contained within an open conduit (channel) either naturally or artificially created, which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water, EXCEPT: wetlands dominated by trees, shrubs, persistent emergents, and emergent mosses or lichens.

Root Crown. The persistent base of an herbaceous perennial. Also used in this book as the top of the root system of a shrub from which multiple aerial stems arise.

Rootstock. A thickened root that can branch and from which above-ground stems arise.

Sand. Composed predominantly of coarse grained mineral sediments with diameters larger than 0.074 mm and smaller than 2 mm (0.08 inches) in diameter.

Saturated. The substrate is saturated to the surface for extended periods during the growing season, but surface water is seldom present.

Scarce. When relating to plant coverage in the association and community type writeups, any species that is absent or has a canopy coverage of less than 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. A groundwater discharge area below which water forms 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 are eventually replaced by other species or communities within a successional sere.

Shore. Land on or near an ocean, lake, river, or stream between the ordinary high water mark and low water mark.

Shoreline 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 6 meters (20 feet) tall and generally exhibits several erect, spreading, or prostrate stems and has a bushy appearance; e.g., mountain alder (*Alnus incana*) or Geyer willow (*Salix geyeriana*).

Silt. Rock fragments between 0.02 mm and 0.002 mm in diameter; as a textural class, a mixture of 20-50% sand, 30-80% silt, and 10-30% 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 species are given in references.)

Sphagnum bog. A palustrine impounded wetland with a mineral-poor substrate composed primarily of *Sphagnum* spp. and which is acidic (pH 5.5).

Spring. A groundwater discharge source, generally confined and producing 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.

Stolon. An elongate, creeping stem on the surface of the ground.

Stoloniferous. Bearing stolons.

Stone. Rock fragments larger than 25.4 cm (10 inches) but less than 60.9 cm (24 inches).

Stream order. A classification of streams according to the number of the tributaries. Order 1 streams have no tributaries; a stream of any higher order has 2 or more tributaries of the next lower order.

Subalpine. The elevational region, identifiable by characteristic vegetation, between the mid-montane 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.

Sward (turf). A covering of grass or grasslike plants, with its matted roots, forming the surface of a grassland, meadow, etc.

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. Intergrades with bog, fen, and 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 plain or lake or sea shore.

Timber production. The indexing of a forest stand to produce wood fiber in cubic feet/acre/ year.

Toe slope. The geomorphic component that forms the outermost, gently inclined surface at the base of a hillslope.

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 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.

Tree. A woody plant which at maturity is usually 6 meters (20 feet) or more in height and generally has a single trunk unbranched to about 1 meters (3 feet) 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.

Volcanic. Pertaining to the structures, rocks, and landforms produced by volcanic action.

Water path. Used in the description of bogs such as the **few-flowered spikerush association** to describe shallow, wide depressions in which water collects and flows during periods of high water. These are not streambeds.

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.

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/riparian species (hydrophytes). Plant species occurring within the wetland/riparian zone. Obligate species require the environmental conditions within the wetland zone. Facultative species tolerate the environmental conditions but may also occur away from the wetland zone.

APPENDIX B. LIST OF PLANT SPECIES ENCOUNTERED

R6 CODE - refers to the alpha codes used in Region 6 of the USDA Forest Service for plant species (Garrison and Skovlin 1976).
PLANTS CODE - refers to the alpha codes that have been assigned in the national PLANTS computer database (USDA Nat. Res. Conserv. Serv., Fort Collins, CO).

TREES

R6 CODE	*PLANTS CODE*	*SCIENTIFIC NAME*	*COMMON NAME*
ABGR	ABGR	*Abies grandis*	Grand Fir
ABLA2	ABLA	*Abies lasiocarpa*	Subalpine Fir
ALRH	ALRH2	*Alnus rhombifolia*	White Alder
ALRU	ALRU2	*Alnus rubra*	Red Alder
JUOC	JUOC	*Juniperus occidentalis*	Western Juniper
LAOC	LAOC	*Larix occidentalis*	Western Larch
PIEN	PIEN	*Picea engelmannii*	Engelmann Spruce
PICO	PICO	*Pinus contorta*	Lodgepole Pine
PIMO	PIMO3	*Pinus monticola*	Western White Pine
PIPO	PIPO	*Pinus ponderosa*	Ponderosa Pine
POTR	POTR5	*Populus tremuloides*	Quaking Aspen
POTR2	POTR15	*Populus trichocarpa*	Black Cottonwood
PSME	PSME	*Pseudotsuga menziesii*	Douglas Fir
TSME	TSME	*Tsuga mertensiana*	Mountain Hemlock

TALL SHRUBS

R6 CODE	*PLANTS CODE*	*SCIENTIFIC NAME*	*COMMON NAME*
ACGL	ACGL	*Acer glabrum*	Rocky Mountain Maple
ALIN	ALIN2	*Alnus incana*	Thin-leaf or Mountain Alder
ALSI	ALSI3	*Alnus sinuata*	Sitka Alder
ALNUS	ALNUS	*Alnus* spp.	Alder
AMAL	AMAL2	*Amelanchier alnifolia*	Western Serviceberry
ARCA	ARCA13	*Artemisia cana*	Silver Sagebrush
ARTEM	ARTEM	*Artemisia* spp.	Sagebrush
ARTR	ARTR2	*Artemisia tridentata*	Big Sagebrush
ARTRV	ARTRV	*Artemisia tridentata* ssp. *vaseyana*	Mountain Big Sagebrush
BEGL	BEGL	*Betula glandulosa*	Bog Birch
BEOC	BEOC2	*Betula occidentalis*	Water Birch
CEVE	CEVE	*Ceanothus velutinus*	Snowbrush Ceanothus or Buckbrush
COST	COST4	*Cornus stolonifera*	Red Osier Dogwood
CRDO	CRDO2	*Crataegus douglasii*	Black Hawthorn
HODI	HODI	*Holodiscus discolor*	Oceanspray
LEGL	LEGL	*Ledum glandulosum*	Labrador Tea or Trapper's Tea
LOIN	LOIN5	*Lonicera involucrata*	Bearberry Honeysuckle or Black Twinberry
LOUT2	LOUT2	*Lonicera utahensis*	Utah Honeysuckle
PHLE2	PHLE4	*Philadelphus lewisii*	Lewis' Mock-orange or Syringa
PHCA3	PHCA11	*Physocarpus capitatus*	Pacific Ninebark
PHMA	PHMA5	*Physocarpus malvaceus*	Mallow Ninebark
PRVI	POTR4	*Prunus virginiana*	Common Chokecherry
PUTR	PUTR2	*Purshia tridentata*	Bitterbrush
RHAL	RHAL2	*Rhododendron albiflorum*	Cascade Azalea
RHAL2	RHAL	*Rhamnus alnifolia*	Alder-leaved Buckthorn
RHPU	RHPU	*Rhamnus purshiana*	Cascara
RIAU	RIAU	*Ribes aureum*	Golden Currant
RIBES	RIBES	*Ribes* spp.	Currant or Gooseberry
RICE	RICE	*Ribes cereum*	Wax or Squaw Currant
RIHU	RIHU	*Ribes hudsonianum*	Stinking Currant
RIIN	RIIN2	*Ribes inerme*	White-stem Gooseberry
RIIR	RIIR	*Ribes irriguum*	Idaho Gooseberry

TALL SHRUBS (cont.)

R6 CODE	PLANTS CODE	SCIENTIFIC NAME	COMMON NAME
RILA	RILA	*Ribes lacustre*	Prickly Currant or Swamp Gooseberry
RINI	RINI2	*Ribes niveum*	Snow Gooseberry
RIVI	RIVI3	*Ribes viscosissimum*	Sticky Currant
RIWO	RIWO	*Ribes wolfii*	Wenaha Currant
ROGY	ROGY	*Rosa gymnocarpa*	Bald-hip Rose
RONU	RONU	*Rosa nutkana*	Nootka Rose
RONUH	RONUH	*Rosa nutkana hispida*	Nootka Rose
ROSA	ROSA5	*Rosa* spp.	Rose
ROWO	ROWO	*Rosa woodsii*	Pear-hip or Wood's Rose
RUID	RUID	*Rubus idaeus*	Red Raspberry
RULE	RULE	*Rubus leucodermis*	White-bark Raspberry
RUPA	RUPA	*Rubus parviflorus*	Western Thimbleberry
SACE	SACE	*Sambucus cerulea*	Blue Elderberry
SABE	SABE2	*Salix bebbiana*	Bebb Willow
SABO2	SABO2	*Salix boothii*	Booth Willow
SACO2	SACO2	*Salix commutata*	Undergreen Willow
SADR	SADR	*Salix drummondiana*	Drummond Willow
SAEA	SAEA	*Salix eastwoodiae*	Eastwood's Willow
SAEX	SAEX	*Salix exigua*	Coyote Willow
SAEXE	no code	*Salix exigua exigua*	Coyote Willow
SAEXM	SAEXM	*Salix exigua melanopsis*	Dusky Willow
SAGE	SAGE2	*Salix geyeriana*	Geyer's Willow
SALA2	SALA5	*Salix lasiandra*	Pacific or Red Willow
SALAC	SALAC	*Salix lasiandra caudata*	Whiplash Willow
SALE	SALE	*Salix lemmoni*	Lemmon's Willow
SALIX	SALIX	*Salix* spp.	Willow
SAMBU	SAMBU	*Sambucus* spp.	Elderberry
SAMY		*Salix myrtillifolia*	Blueberry or Bilberry Willow
=SABO2		= *Salix boothii*	= Booth Willow
SARA	SARA2	*Sambucus racemosa*	Black Elderberry
SARI	SARI2	*Salix rigida*	Rigid Willow
SARIM2	SARIM4	*Salix rigida mackenzieana*	Mackenzie Willow
SARIW	SARIW	*Salix rigida watsonii*	Watson Willow
SASC	SASC	*Salix scouleriana*	Scouler Willow
SASI2	SASI2	*Salix sitchensis*	Sitka Willow
SATW	SATW	*Salix tweedyi*	Tweedy's Willow
SOSC2	SOSC2	*Sorbus scopulina*	Cascade Mountain Ash
SPBE	SPBE2	*Spiraea betulifolia*	Birch-leaf or Shiny-Leaf Spiraea
SYAL	SYAL	*Symphoricarpos albus*	Common Snowberry
SYOR	SYOR2	*Symphoricarpos oreophilus*	Mountain Snowberry
TABR	TABR2	*Taxus brevifolia*	Pacific Yew
VAME	VAME	*Vaccinium membranaceum*	Big Huckleberry
VAUL	VAUL	*Vaccinium uliginosum*	Bog Blueberry

LOW SHRUBS

R6 CODE	PLANTS CODE	SCIENTIFIC NAME	COMMON NAME
ARAR	ARAR8	*Artemisia arbuscula*	Low Sagebrush
BERE	BERE	*Berberis repens*	Creeping or Low Oregon-grape
CHME	CHME	*Chimaphila menziesii*	Little Prince's Pine or Pipissewa
CHUM	CHUM	*Chimaphila umbellata*	Common Prince's Pine
CHVI	CHVI8	*Chrysothamnus viscidiflorus*	Green Rabbitbrush
KAMI	KAMI	*Kalmia microphylla*	Alpine Laurel
LIBO2	LIBO3	*Linnaea borealis*	American Twinflower
LOCI	LOCI3	*Lonicera ciliosa*	Western Trumpet Honeysuckle
PAMY	PAMY	*Pachistima myrsinites*	Oregon Boxwood
PHEM	PHEM	*Phyllodoce empetriformis*	Red or Pink Mountain-heath
POFR	POFR4	*Potentilla fruticosa*	Bush or Shrubby Cinquefoil
RUUR	RUUR	*Rubus ursinus*	Pacific Blackberry
VACA	VACE	*Vaccinium caespitosum*	Dwarf Huckleberry
VAMY	VAMY2	*Vaccinium myrtillus*	Dwarf or Low Bilberry
VASC	VASC	*Vaccinium scoparium*	Grouse Huckleberry or Whortleberry

PERENNIAL FORBS

R6 CODE	PLANTS CODE	SCIENTIFIC NAME	COMMON NAME
ACMI	ACMI2	*Achillea millefolium*	Yarrow
ACCO	ACCO4	*Aconitum columbianum*	Columbia Monkshood
ACCOC	ACCOC2	*Aconitum columbianum columbianum*	Columbia Monkshood
ACCOO	ACCOO	*Aconitum columbianum ochroleucrum*	Green Columbia Monkshood
ACRU	ACRU2	*Actaea rubra*	Baneberry
ADBI	ADBI	*Adenocaulon bicolor*	Trail Plant or Pathfinder
AGUR	AGUR	*Agastache urticifolia*	Nettle-leaf Horse-mint
AGGL	AGGL	*Agoseris glauca*	Pale Agoseris
AGGLD	AGGLD	*Agoseris glauca dasycephala*	Pale Agoseris
AGGR	AGGR	*Agoseris grandiflora*	Large-flowered Agoseris
ALGE2	ALGE	*Allium geyeri*	Geyer's Onion
ALLIU	ALLIU	*Allium* spp.	Onion
ALVA	ALVA	*Allium validum*	Pacific or Swamp Onion
AMME	AMME	*Amsinckia menziesii*	Menzie's or Small-flowered Fiddleneck
ANAL	ANAL4	*Antennaria alpina*	Alpine Pussytoes
ANFI	ANFI	*Androsace filiformis*	Slender-stemmed Fairy-candlabra
ANMA	ANMA	*Anaphalis margaritacea*	Pearly-everlasting
ANOC2	ANOC2	*Androsace occidentalis*	Western Fairy-candelabra
ANOR	ANOR	*Anemone oregana*	Oregon Anemone
ANPI	ANPI	*Anemone piperi*	Piper's Anemone or Windflower
ANAR2	ANAR3	*Angelica arguta*	Sharptooth Angelica
ANAN	ANAN2	*Antennaria anaphaloides*	Tall Pussytoes
ANMI2	ANMI3	*Antennaria microphylla*	Rosy Pussytoes
ANRO	ANRO2	*Antennaria rosea*	Rosy Pussytoes
ANTEN	ANTEN	*Antennaria* spp.	Pussytoes
APAN	APAN2	*Apocynum androsaemifolium*	Spreading Dogbane
AQFO	AQFO	*Aquilegia formosa*	Red Columbine
ARABI	ARABI2	*Arabis* spp.	Rockcress
ARCO2	ARCO5	*Arenaria congesta*	Ballhead or Capitate Sandwort
ARGL	ARGL	*Arabis glabra*	Tower Mustard
ARHI	ARHI	*Arabis hirsuta*	Hairy Rockcress
ARLA2	ARLA15	*Arenaria lateriflora*	Blunt-leaf Sandwort
ARMA3	ARMA18	*Arenaria macrophylla*	Big-leaf Sandwort
ARENA	ARENA	*Arenaria* spp.	Sandwort
ARAM	ARAM2	*Arnica amplexicaulis*	Streambank Arnica
ARCH	ARCH3	*Arnica chamissonis*	Leafy or Meadow Arnica
ARCHF	ARCHF2	*Arnica chamissonis foliosa*	Leafy or Meadow Arnica
ARCO	ARCO9	*Arnica cordifolia*	Heartleaf Arnica
ARLA	ARLA8	*Arnica latifolia*	Mountain Arnica
ARMO	ARMO4	*Arnica mollis*	Hairy Arnica
ARSO	ARSO2	*Arnica sororia*	Twin Arnica
ARNIC	ARNIC	*Arnica* spp.	Arnica
ARLU	ARLU	*Artemisia ludoviciana*	Prairie Sage
ARLUL	ARLUL	*Artemisia ludoviciana latiloba*	Prairie Sage
ASAL	ASAL2	*Aster alpigenus*	Alpine Aster
ASCA2	ASCA6	*Aster campestris*	Western Meadow Aster
ASCA3	ASCA2	*Asarum caudatum*	Wild Ginger
ASCA7	ASCA11	*Astragalus canadensis*	Canada milkvetch
ASCAC	ASCAC4	*Aster campestris campestris*	Western Meadow Aster
ASCAM	ASCAM3	*Astragalus canadensis mortoni*	Canada Milkvetch
ASCH	ASCH2	*Aster chilensis*	Long-leaved Aster
ASCHA	ASCHA	*Aster chilensis adscendens*	Long-leaved Aster
ASCO	ASCO3	*Aster conspicuus*	Showy Aster
ASEA	ASEA	*Aster eatonii*	Eaton's Aster
ASFO	ASFO	*Aster foliaceus*	Leafy Aster
ASFOC	ASFOC2	*Aster foliaceus cusickii*	Leafy Aster
ASFOP	ASFOP	*Aster foliaceus parryi*	Leafy Aster
ASIN	ASIN3	*Aster integrifolius*	Thick-stemmed, Sticky or Entire-leaved Aster
ASLAG	ASLAG	*Aster laevis geyeri*	Smooth Aster
ASMO	ASMO3	*Aster modestus*	Great North Aster
ASOC	ASOC	*Aster occidentalis*	Western Mountain Aster
ASRO	ASRO	*Astragalus robbinsii*	Robbin's Milkvetch
ASTER	ASTER	*Aster* spp.	Aster
ASTRA	ASTRA	*Astragalus* spp.	Milkvetch

PERENNIAL FORBS (cont.)

R6 CODE	*PLANTS CODE*	*SCIENTIFIC NAME*	*COMMON NAME*
BAOR	BAOR	*Barbarea orthoceras*	American Wintercress
BERU	BERU	*Besseya rubra*	Kitten-tail or Besseya
BODE	BODE	*Boisduvalia densiflora*	Dense Spike-primrose
BRDO	BRDO	*Brodiaea douglasii*	Douglas' Brodiaea
BRHY	BRHY2	*Brodiaea hyacinthina*	Hyacinth Brodiaea
BRODI	BRODI	*Brodiaea* spp.	Brodiaea
CAAP2	CAAP4	*Castilleja applegatei*	Wavy-leaved Paintbrush
CABI	CABI2	*Caltha biflora*	Twinflower Marshmarigold
CABR2	CABR6	*Cardamine breweri*	Brewer's Bittercress
CABU2	CABU	*Calypso bulbosa*	Calypso Orchid
CACO2	CACO6	*Cardamine cordifolia*	Large Mountain Bittercress
CACOL	CACOL4	*Cardamine cordifolia lyallii*	Large Mountain Bittercress
CACU3	CACU7	*Castilleja cusickii*	Cusick's Paintbrush
CALOC	CALOC	*Calochortus* spp.	Mariposa or Sego Lily
CAOL	CAOL	*Cardamine oligosperma*	Little Western Bittercress
CAPE4	CAPE3	*Cardamine pensylvanica*	Pacific Bittercress
CAQU	CAQU2	*Camassia quamash*	Common Camas
CALE2	CALE4	*Caltha leptosepala*	Elkslip or Marsh-marigold
CALI2	CALI4	*Castilleja linariaefolia*	Narrow-leaved Paintbrush
CAMI2	CAMI12	*Castilleja miniata*	Scarlet Paintbrush
CAOC	CAOC	*Cardamine occidentalis*	Western Bittercress
CARDA	CARDA	*Cardamine* spp.	Bittercress
CASTI	CASTI2	*Castilleja* spp.	Paintbrush
CEAR	CEAR4	*Cerastium arvense*	Field Chickweed or Starry Cerastium
CENU	CANU2	*Cerastium nutans*	Nodding Chickweed
CERAS	CERAS	*Cerastium* spp.	Chickweed
CEVI	CEVI3	*Cerastium viscosum*	Sticky Cerastium
CHLE2	CHLE80	*Chrysanthemum leucanthemum*	Oxeye Daisy
CIAL	CIAL	*Circaea alpina*	Enchanter's Nightshade
CIAR	CIAR4	*Cirsium arvense*	Canada Thistle
CICA2	CICA6	*Cirsium canovirens*	Gray-green Thistle
CIDO	CIDO	*Cicuta douglasii*	Douglas' Water-hemlock
CIUN	CIUN	*Cirsium undulatum*	Wavy-leaved Thistle
CLCOC	CLCOC2	*Clematis columbiana columbiana*	Columbia Virgin's bower
CLLI	CLLI2	*Clematis ligusticifolia*	Western Virgin's-bower or Clematis
CLUN	CLUN2	*Clintonia uniflora*	Queen's Cup Bead-lily
COMA3	COMA4	*Corallorhiza maculata*	Spotted Coral-root
COCA	COCA13	*Cornus canadensis*	Bunch-berry
COCAC	COCAC2	*Corydalis caseana cusickii*	Case's Corydalis
CRTO	CRTO4	*Cryptantha torreyana*	Torrey's Cryptantha
CYOF	CYOF	*Cynoglossum officinale*	Common Hounds-tongue
CYMO	CYMO2	*Cypripedium montanum*	Mountain Lady's-slipper
DEBU	DEBU	*Delphinium burkei*	Burke's Larkspur
DEDE	DEDE2	*Delphinium depauperatum*	Slim or Dwarf Larkspur
DEOC	DEOC	*Delphinium occidentale*	Western Larkspur
DELPH	DELPH	*Delphinium* spp.	Larkspur
DEPIP	DEPIP3	*Descurainia pinnata pinnata*	Western Tansymustard
DESO	DESO2	*Descurainia sophia*	Flixweed Tansymustard
DIAR	DIAR	*Dianthus armeria*	Deptford Pink
DICU	DICU	*Dicentra cucullaria*	Dutchman's Breeches
DISY	DISY	*Dipsacus sylvestris*	Teasel
DIHO	DIHO3	*Disporum hookeri*	Hooker's Fairy-bells
DISPO	DISPO	*Disporum* spp.	Fairy-bells
DITR	DITR2	*Disporum trachycarpum*	Wartberry Fairy-bells
DOAL	DOAL	*Dodecatheon alpinum*	Alpine Shooting-star
DODE	DODE	*Dodecatheon dentatum*	Dentate or White Shooting-star
DOJE	DOJE	*Dodecatheon jeffreyi*	Jeffrey's Shooting-star
DODEC	DODEC	*Dodecatheon* spp.	Shooting-star
EPAL	EPAL	*Epilobium alpinum*	Alpine Willow-herb
EPAN	EPAN2	*Epilobium angustifolium*	Fireweed
EPGL	EPGL	*Epilobium glaberrimum*	Smooth Willow-herb
EPGL2	EPGL4	*Epilobium glandulosum*	Common Willow-herb

R6 CODE	PLANTS CODE	SCIENTIFIC NAME	COMMON NAME

PERENNIAL FORBS (cont.)

R6 CODE	PLANTS CODE	SCIENTIFIC NAME	COMMON NAME
EPGLG	no code	*Epilobium glandulosum glandulosum*	Common Willow-herb
EPLA	EPLA	*Epilobium latifolium*	Red Willow-herb
EPPA2	EPPA	*Epilobium palustre*	Swamp Willow-herb
EPILO	EPILO	*Epilobium* spp.	Willow-herb
EPWA	EPWA3	*Epilobium watsonii*	Watson's Willow-herb
EQVA	EQVA	*Equisetum variegatum*	Northern Scouringrush
ERCH	ERCH4	*Erigeron chrysopsidis*	Dwarf Yellow Fleabane
ERCO4	ERCO6	*Erigeron coulteri*	Coulter's Daisy
ERDI	ERDI4	*Erigeron divergens*	Spreading or Diffuse Fleabane
EREA	EREA	*Erigeron eatonii*	Eaton's Daisy
ERGR	ERGR9	*Erythronium grandiflorum*	Fawnlily, Glacierlily or Dogtooth Violet
ERHE	ERHE2	*Eriogonum heracleoides*	Wyeth's Creamy Buckwheat
ERIGE	ERIGE2	*Erigeron* spp.	Daisy or Fleabane
ERLO	ERLO	*Erigeron lonchophyllus*	Spear-leaf Fleabane
ERPE	ERPE3	*Erigeron peregrinus*	Subalpine Daisy
ERPEC	ERPEC	*Erigeron peregrinus callianthemus*	Subalpine Daisy
ERPEE	ERPEE	*Erigeron peregrinus callianthemus eucallianthemus*	Subalpine Daisy
ERPH	ERPH	*Erigeron philadelphicus*	Philadelphia Fleabane
ERLA	ERLA6	*Eriophyllum lanatum*	Oregon Sunshine
ERUM	ERUM	*Eriogonum umbellatum*	Sulphur Buckwheat
FRAGA	FRAGA	*Fragaria* spp.	Strawberry
FRSP	FRSP	*Frasera speciosa*	Giant Frasera
FRVE	FRVE	*Fragaria vesca*	Woods Strawberry
FRVI	FRVI	*Fragaria virginiana*	Broad-petal Strawberry
FRVIP	FRVIP3	*Fragaria virginiana platypetala*	Broad-petal Strawberry
FRITI	FRITI	*Fritillaria* spp.	Fritillary
GAAS	GAAS3	*Galium asperrimum*	Rough Bedstraw
GABO	GABO2	*Galium boreale*	Northern Bedstraw
GALIU	GALIU	*Galium* spp.	Bedstraw
GATR3	GATR2	*Galium trifidum*	Small Cleavers
GATR	GATR3	*Galium triflorum*	Sweet-scented Bedstraw
GEAF	GEAF	*Gentiana affinis*	Pleated or Prairie Gentian
GECA	GECA	*Gentiana calycosa*	Explorer's or Mountain-bog Gentian
GECAO	GECAO	*Gentiana calycosa obtusiloba*	Explorer's or Mountain-bog Gentian
GEVI	GEVI2	*Geranium viscosissimum*	Sticky Geranium
GEMA	GEMA4	*Geum macrophyllum*	Large-leaf Avens
GETR	GETR	*Geum triflorum*	Red Avens or Old Man's Whiskers
GIAG	GIAG	*Gilia aggregata*	Sky-rocket Gilia
GNMI	GNMI	*Gnaphalium microcephalum*	White Cudweed
GNPA	GNPA	*Gnaphalium palustre*	Lowland Cudweed
GOOB	GOOB2	*Goodyera oblongifolia*	Rattlesnake-plantain
HADI2	HADI7	*Habenaria dilatata*	White Bog-orchid
HADIL	HADIL	*Habenaria dilatata leucostachys*	White Bog-orchid
HASA	HASA	*Habenaria saccata*	Slender Bog-orchid
HABEN	HABEN	*Habenaria* spp.	Bog-orchid
HAUN	HAUN	*Habenaria unalascensis*	Alaska Rein-orchid
HAJE	HAJE	*Hackelia jessicae*	Blue Stickseed
HAMI	HAMI	*Hackelia micrantha*	Blue Stickseed
HAHI	HAHI	*Haplopappus hirtus*	Sticky Goldenweed
HALA2	HALA2	*Haplopappus lanceolatus*	Lanceleaf Goldenweed
HEUN	HEUN	*Helianthella uniflora*	One-flowered Helianthella
HELA	HELA4	*Heracleum lanatum*	Common Cowparsnip
HECY	HECY2	*Heuchera cylindrica*	Round-leaf Alumroot
HEUCH	HEUCH	*Heuchera* spp.	Alumroot
HIAL2	HIAL	*Hieracium albertinum*	Western Hawkweed
HIAL	HIAL2	*Hieracium albiflorum*	White Hawkweed
HICY	HICY	*Hieracium cynoglossoides*	Hounds-tongue Hawkweed
HIERA	HIERA	*Hieracium* spp.	Hawkweed
HISC	HISC2	*Hieracium scouleri*	Woolly Weed
HIVU	HIVU2	*Hippuris vulgaris*	Common Mare's Tail
HOFU	HOFU	*Horkelia fusca*	Tawny Horkelia

PERENNIAL FORBS (cont.)

R6 CODE	PLANTS CODE	SCIENTIFIC NAME	COMMON NAME
HYCA	HYCA4	*Hydrophyllum capitatum*	Ballhead Waterleaf or Woolly Breeches
HYFE	HYFE	*Hydrophyllum fendleri*	Fendler's Waterleaf
HYDRO	HYDRO4	*Hydrophyllum* spp.	Waterleaf
HYAN	HYAN2	*Hypericum anagalloides*	Bog St. John's Wort
HYFO	HYFO4	*Hypericum formosum*	Western St. John's Wort
HYFOS	HYFOS	*Hypericum formosum scouleri*	Western St. John's Wort
HYPE	HYPE	*Hypericum perforatum*	Klamathweed, St. John's Wort or Goatweed
IRMI	IRMI	*Iris missouriensis*	Western Blue Flag or Rocky Mtn. Iris
IRIS	IRIS	*Iris* spp.	Iris
KEGA	KEGA	*Kelloggia galioides*	Kelloggia
LABI2	LABI	*Lactuca biennis*	Tall Blue Lettuce
LANE	LANE	*Lathyrus nevadensis*	Sierra Peavine
LANEC	LANEC	*Lathyrus nevadensis cusickii*	Cusick's or Sierra Peavine
LATHY	LATHY	*Lathyrus* spp.	Peavine
LEMI	LEMI3	*Lemna minor*	Duckweed or Water Lentil
LEPE	LEPE2	*Lepidium perfoliatum*	Clasping Pepper-grass
LIGR	LIGR	*Ligusticum grayi*	Gray's Licoriceroot or Gray's Lovage
LIGUS	LIGUS	*Ligusticum* spp.	Licoriceroot
LITE2	LITE2	*Ligusticum tenuifolium*	Slender-leaved Licoriceroot
LIHA	LIHA	*Linanthus harknessii*	Harkness' Linanthus
LICA3	LICA10	*Listera caurina*	Western Twayblade
LICO2	LICO5	*Listera convallarioides*	Broad-lipped Twayblade
LISTE	LISTE	*Listera* spp.	Twayblade
LIPA	LIPA5	*Lithophragma parviflora*	Small-flowered Fringecup
LITHO	LITHO2	*Lithophragma* spp.	Fringecup
LOAM	LOAM	*Lomatium ambiguum*	Wyeth Biscuitroot
LOCO3	LOCO6	*Lotus corniculatus*	Birds-foot Lotus
LOTR	LOTR2	*Lomatium triternatum*	Nine-leaf Desert Parsley
LOTUS	LOTUS	*Lotus* spp.	Lotus
LULE	LULE3	*Lupinus leucophyllus*	Velvet or Woolly Lupine
LUPO	LUPO2	*Lupinus polyphyllus*	Big-leaf Lupine
LUPOB	LUPOB3	*Lupinus polyphyllus burkei*	Big-leaf Lupine
LUPIN	LUPIN	*Lupinus* spp.	Lupine
MEAR3	MEAR4	*Mentha arvensis*	Field Mint
MECI	MECI3	*Mertensia ciliata*	Broad-leaf Bluebells
MELO	MELO4	*Mertensia longiflora*	Small Bluebells
MELU	MELU	*Medicago lupulina*	Black Medic
MENTH	MENTH	*Mentha* spp.	Mint
MEPA	MEPA	*Mertensia paniculata*	Tall Bluebells
MEPAB	MEPAB	*Mertensia paniculata borealis*	Tall Bluebells
METR	METR3	*Menyanthes trifoliata*	Buckbean
MEVI	MEVI4	*Mertensia viridis*	Green Bluebells
MICRO3	MICRO6	*Microseris* spp.	Microseris
MIGR	MIGR	*Microsteris gracilis*	Pink Microsteris
MIGU	MIGU	*Mimulus guttatus*	Common Monkey-flower
MILE	MILE2	*Mimulus lewisii*	Lewis' Monkey-flower
MIMO	MIMO3	*Mimulus moschatus*	Musk Monkey-flower
MIMOM	MIMOM2	*Mimulus moschatus moschatus*	Musk Monkey-flower
MINU	MINU	*Microseris nutans*	Nodding Microseris
MIPR	MIPR	*Mimulus primuloides*	Primrose Monkey-flower
MIMUL	MIMUL	*Mimulus* spp.	Monkey-flower
MIPE	MIPE	*Mitella pentandra*	Alpine or Five-stamen Mitrewort
MIST2	MIST3	*Mitella stauropetala*	Side-flowered Mitrewort
MITEL	MITEL	*Mitella* spp.	Mitrewort
MITR	MITR5	*Microseris troximoides*	False Agoseris
MOUN2	MOUN3	*Monotropa uniflora*	Indian Pipe
MOCH	MOCH	*Montia chamissoi*	Water Montia
MOCO	MOCO4	*Montia cordifolia*	Heart-leaved Miner's-lettuce
MOSI	MOSI2	*Montia sibirica*	Siberian Miners-lettuce or Candy-flower
MONTI	MONTI	*Montia* spp.	Miner's-lettuce
MYAR	MYAR2	*Myosurus aristatus*	Bristly Mouse-tail
MYOSO	MYOSO	*Myosotis* spp.	Forget-me-not

PERENNIAL FORBS (cont.)

R6 CODE	*PLANTS CODE*	*SCIENTIFIC NAME*	*COMMON NAME*
MYSC	MYSC	*Myosotis scorpioides*	Common Forget-me-not
NAIN	NAIN2	*Navarretia intertexta*	Needle-leaf Navarretia
NEPE	NEPE	*Nemophila pedunculata*	Meadow Nemophila
OSCH	OSCH	*Osmorhiza chilensis*	Mountain Sweet-cicely or Sweet-root
OSOC	OSOC	*Osmorhiza occidentalis*	Western Sweet-cicely
PAFI	PAFI3	*Parnassia fimbriata*	Rocky Mountain Grass-of-Parnassus
PEGA	PEGA3	*Penstemon gairdneri*	Gairdner's Penstemon
PEGL4	PEGL5	*Penstemon globosus*	Globe Penstemon
PEGR	PEGR2	*Pedicularis groenlandica*	Elephant's Head or Pink Elephants
PERA	PERA	*Pedicularis racemosa*	Leafy or Sickle-top Lousewort
PEAT	PEAT3	*Penstemon attenuatus*	Sulphur Penstemon
PERY	PERY	*Penstemon rydbergii*	Rydberg's Penstemon
PENST	PENST	*Penstemon* spp.	Penstemon
PEVE	PEVE2	*Penstemon venustus*	Blue Mountain or Lovely Penstemon
PEBO	PEBO2	*Perideridia bolanderi*	Bolander's Yampah
PEGA2	PEGA3	*Perideridia gairdneri*	Gairdner's Yampah
PHLOX	PHLOX	*Phlox* spp.	Phlox
PEFRP	PEFRP	*Petasites frigidus palmatus*	Sweet Coltsfoot
PLLA	PLLA	*Plantago lanceolata*	Buckhorn Plantain
PLMA	PLMA2	*Plantago major*	Nippleseed Plantain
POAN4	POAN5	*Potentilla anserina*	Common Silverweed
PODI	PODI2	*Potentilla diversifolia*	Diverse-leaved Cinquefoil
PODO	PODO4	*Polygonum douglasii*	Douglas' Knotweed
POKE	POKE2	*Polygonum kelloggii*	Kellogg's Knotweed
POOC	POOC2	*Polemonium occidentale*	Western Polemonium
POPU	POPU3	*Polemonium pulcherrimum*	Skunk-leaved Polemonium
POLEM	POLEM	*Polemonium* spp.	Jacob's Ladder or Polemonium
POBI	POBI6	*Polygonum bistortoides*	American or Western Bistort
POMA2	POMA9	*Polygonum majus*	Wiry or Palouse Knotweed
POLYG	POLYG4	*Polygonum* spp.	Knotweed
POFL2	POFL3	*Potentilla flabellifolia*	Fan-leaved Cinquefoil
POGL	POGL9	*Potentilla glandulosa*	Glandular or Sticky Cinquefoil
POGR	POGR9	*Potentilla gracilis*	Northwest or Slender Cinquefoil
POGRE	POGRE	*Potentilla gracilis elmeri*	Northwest or Slender Cinquefoil
PORE2	PORE5	*Potentilla recta*	Erect Cinquefoil
POTEN	POTEN	*Potentilla* spp.	Cinquefoil
PRVU	PRVU	*Prunella vulgaris*	Common Self-heal
PTAN	PTAN2	*Pterospora andromedea*	Woodland Pinedrops
PYAS	PYAS	*Pyrola asarifolia*	Common or Pink Wintergreen
PYCH	PYCH	*Pyrola chlorantha*	Green Pyrola
PYSE	PYSE	*Pyrola secunda*	Side-bells Pyrola
PYUN	PYUN	*Pyrola uniflora*	Wood-nymph
RAAC	RAAC3	*Ranunculus acris*	Meadow Buttercup
RAAL	RAAL	*Ranunculus alismaefolius*	Plantain-leaf Buttercup
RAAQ	RAAQ	*Ranunculus aquatilis*	White Water Buttercup
RACY	RACY	*Ranunculus cymbalaria*	Shore Buttercup
RAES	RAES	*Ranunculus eschscholtzii*	Eschscholtz' Buttercup
RAFL2	RAFL2	*Ranunculus flammula*	Creeping Buttercup
RAGM	RAGM	*Ranunculus gmelinii*	Small Yellow Water Buttercup
RAOC	RAOC	*Ranunculus occidentalis*	Western Buttercup
RAOR	RAOR3	*Ranunculus orthorhynchus*	Straight-beak Buttercup
RAORP	RAORP	*Ranunculus orthorhynchus platyphyllus*	Straight-beak Buttercup
RAPO	RAPO	*Ranunculus populago*	Mountain Buttercup
RARE	RARE3	*Ranunculus repens*	Creeping Buttercup
RARER	RARER	*Ranunculus repens repens*	Creeping Buttercup
RASC	RASC3	*Ranunculus sceleratus*	Celery-leaved or Blister Buttercup
RANUN	RANUN	*Ranunculus* spp.	Buttercup
RAUN2	RAUN	*Ranunculus uncinatus*	Wood Buttercup
ROCU	ROCU	*Rorippa curvisiliqua*	Western Yellowcress
RONA	RONA2	*Rorippa nasturtium-aquaticum*	Watercress

PERENNIAL FORBS (cont.)

R6 CODE	*PLANTS CODE*	*SCIENTIFIC NAME*	*COMMON NAME*
RUOC	RUOC2	*Rudbeckia occidentalis*	Western Coneflower
RUAC	RUAC3	*Rumex acetosella*	Sheep-sorrel or Red Sorrel
RUCR	RUCR	*Rumex crispus*	Curly Dock
RUOC2	RUOC2	*Rumex occidentalis*	Western Dock
RUSA	RUSA	*Rumex salicifolius*	Willow Dock
RUMEX	RUMEX	*Rumex* spp.	Dock
SAMI2	SAMI3	*Sanguisorba minor*	Garden Burnet
SASI	SASI10	*Sanguisorba sitchensis*	Sitka Burnet
SAAM	SAAM3	*Saussurea americana*	American Sawwort
SAAR4	SAAR13	*Saxifraga arguta*	Brook Saxifrage
SAOR	SAOR2	*Saxifraga oregana*	Bog or Oregon Saxifrage
SAXIF	SAXIF	*Saxifraga* spp.	Saxifrage
SCAN2	SCAN4	*Scutellaria antirrhinoides*	Snapdragon Skullcap
SCLA	SCLA	*Scrophularia lanceolata*	Lance-leaf Figwort
SEDUM	SEDUM	*Sedum* spp.	Stonecrop
SEHY	SEHY2	*Senecio hydrophilus*	Alkali-marsh Butterweed
SEST	SEST2	*Sedum stenopetalum*	Worm-leaf Stonecrop
SECR	SECR	*Senecio crassulus*	Thick-leaf Groundsel
SECY	SECY	*Senecio cymbalarioides*	Alpine Meadow Butterweed
SEFO	SEFO	*Senecio foetidus*	Sweetmarsh Butterweed
SEFOH	SEFOH	*Senecio foetidus hydrophylloides*	Sweetmarsh Butterweed
SEIN	SEIN2	*Senecio integerrimus*	Western or Woolly Groundsel
SEPS	SEPS2	*Senecio pseudaureus*	Streambank Butterweed
SESE	SESE2	*Senecio serra*	Butterweed Groundsel
SENEC	SENEC	*Senecio* spp.	Groundsel or Butterweed
SETR	SETR	*Senecio triangularis*	Arrow-leaf Groundsel
SETRT	no code	*Senecio triangularis triangularis*	Arrow-leaf Groundsel
SEVU	SEVU	*Senecio vulgaris*	Common Groundsel
SIAN	SIAN3	*Sisyrinchium angustifolium*	Blue-eyed Grass
SIME	SIME	*Silene menziesii*	Menzies' Silene
SIMEM	SIMEM	*Silene menziesii menziesii*	Menzies' Silene
SIOR	SIOR	*Sidalcea oregana*	Oregon Checkermallow
SIORP	SIORP2	*Sidalcea oregana procera*	Oregon Checkermallow
SIPR	SIPR	*Sibbaldia procumbens*	Creeping Sibbaldia
SISYR	SISYR	*Sisyrinchium* spp.	Grass-widows
SMRA	SMRA	*Smilacina racemosa*	Feathery Solomonplume
SMST	SMST	*Smilacina stellata*	Starry False-Solomon's Seal
SONI	SONI	*Solanum nigrum*	Black or Garden Nightshade
SOCA	SOCA6	*Solidago canadensis*	Meadow Goldenrod
SOCAS	SOCAS	*Solidago canadensis salebrosa*	Meadow Goldenrod
SOOC2	SOOC4	*Solidago occidentalis*	Western Goldenrod
SOLID	SOLID	*Solidago* spp.	Goldenrod
SPAN	SPAN2	*Sparganium angustifolium*	Narrow-leafed Bur-reed
SPEM	SPAN2	*Sparganium emersum*	Simple-stem Bur-reed
SPRO	SPRO	*Spiranthes romanzoffiana*	Ladies-tresses
STCR	STCR2	*Stellaria crispa*	Crisped Starwort
STLO2	STLO	*Stellaria longifolia*	Long-leaved Starwort
STLO	STLO2	*Stellaria longipes*	Long-stalk Starwort
STLOL	STLOL3	*Stellaria longipes longipes*	Long-stalk Starwort
STME	STME2	*Stellaria media*	Chickweed
STELL	STELL	*Stellaria* spp.	Chickweed
STOC2	STOC	*Stenanthium occidentale*	Western Stenanthium
STAM	STAM2	*Streptopus amplexifolius*	Clasp-leaf Twistedstalk
TACE	TACE	*Taraxacum ceratophorum*	Horned Dandelion
TAOF	TAOF	*Taraxacum officinale*	Common Dandelion
TARAX	TARAX	*Taraxacum* spp.	Dandelion
THFE2	THFE	*Thalictrum fendleri*	Fendler's Meadowrue
THOC	THOC	*Thalictrum occidentale*	Western Meadowrue
THMO	THMO6	*Thermopsis montana*	Mountain Thermopsis or Golden Pea
THSP	THSP	*Thalictrum sparsiflorum*	Few-flowered Meadowrue
TITR	TITR	*Tiarella trifoliata*	Cool-wort Foam-flower
TITRT	TITRT	*Tiarella trifoliata trifoliata*	Cool-wort Foam-flower
TITRU	TITRU	*Tiarella trifoliata unifoliata*	Cool-wort Foam-flower
TRCA3	TRCA	*Trautvetteria caroliniensis*	False Bugbane
TRER	TRER2	*Trifolium eriocephalum*	Woolly-headed Clover

PERENNIAL FORBS (cont.)

R6 CODE	PLANTS CODE	SCIENTIFIC NAME	COMMON NAME
TRERP	TRERP2	*Trifolium eriocephalum piperi*	Woolly-headed Clover
TRIFO	TRIFO	*Trifolium* spp.	Clover
TRILL	TRILL	*Trillium* spp.	Trillium
TRLA	TRLA8	*Trifolium latifolium*	Twin Clover
TRLA2	TRLA6	*Trientalis latifolia*	Broad-leaved Star-flower
TRLAA	TRLAA	*Trollius laxus albiflorus*	Globe-flower
TRLO	TRLO	*Trifolium longipes*	Long-stalked Clover
TRLOL	TRLOL3	*Trifolium longipes longipes*	Long-stalked Clover
TRPR	TRPR2	*Trifolium pratense*	Red Clover
TRRE	TRRE3	*Trifolium repens*	White Clover
TRVA	TRVA	*Trifolium variegatum*	White-tip Clover
TRWO2	TRWO	*Trifolium wormskjoldii*	Springbank Clover
TROV	TROV2	*Trillium ovatum*	White Trillium
TRPE	TRPE3	*Trillium petiolatum*	Purple Trillium
URDI	URDI	*Urtica dioica*	Stinging Nettle
TYLA	TYLA	*Typha latifolia*	Common Cattail
VAAC	VAAC	*Valeriana acutiloba*	Downy-fruited Valerian
VAED	VAED	*Valeriana edulis*	Edible Valerian or Tobacco-root
VAOC	VAOC2	*Valeriana occidentalis*	Western Valerian
VASI	VASI	*Valeriana sitchensis*	Sitka Valerian
VALER	VALER	*Valeriana* spp.	Valerian
VECA	VECA2	*Veratrum californicum*	California False-hellebore
VERAT	VERAT	*Veratrum* spp.	False-hellebore
VEVI	VEVI	*Veratrum viride*	Green False-hellebore
VEAM	VEAM2	*Veronica americana*	American Speedwell
VESC	VESC2	*Veronica scutellata*	Skullcap Speedwell
VESE	VESE	*Veronica serpyllifolia*	Thyme-leaved Speedwell
VERON	VERON	*Veronica* spp.	Speedwell
VEWO	VEWO2	*Veronica wormskjoldii*	Wormskjold Speedwell
VIAM	VIAM	*Vicia americana*	American Vetch
VIAMT	VIAMT2	*Vicia americana truncata*	American Vetch
VIAD	VIAD	*Viola adunca*	Early Blue Violet
VICA	VICA4	*Viola canadensis*	Canada Violet
VICIA	VICIA	*Vicia* spp.	Vetch
VIGL	VIGL	*Viola glabella*	Stream or Woodland Violet
VIMA	VIMA2	*Viola macloskeyi*	Small White or Macloskey's Violet
VINU	VINU2	*Viola nuttallii*	Nuttall's Violet
VIOLA	VIOLA	*Viola* spp.	Violet
VIOR2	VIOR	*Viola orbiculata*	Darkwoods or Round-leaved Violet
VIPA2	VIPA4	*Viola palustris*	Marsh Violet
VIPU	VIPU4	*Viola purpurea*	Goose-foot Violet
WYHE	WYHE2	*Wyethia helianthoides*	White-headed Mule's Ear
ZIEL	ZIEL2	*Zigadenus elegans*	Mountain Death Camas
ZIPA	ZIPA2	*Zigadenus paniculatus*	Panicled Death Camas

PERENNIAL GRASSES

R6 CODE	PLANTS CODE	SCIENTIFIC NAME	COMMON NAME
AGAL	AGAL3	*Agrostis alba*	Creeping Bentgrass
AGALA	no code	*Agrostis alba alba*	Creeping Bentgrass
AGALP	AGALP	*Agrostis alba palustris*	Creeping Bentgrass
AGCA	AGCA2	*Agropyron caninum*	Bearded or Awned Wheatgrass
AGDA	AGDA	*Agropyron dasystachyum*	Thickspike Wheatgrass
AGDI	AGDI	*Agrostis diegoensis*	Thin or Leafy Bentgrass
AGEX	AGEX	*Agrostis exarata*	Spike Bentgrass
AGEXM2	AGEXM3	*Agrostis exarata minor*	Spike Bentgrass
AGHU	AGHU	*Agrostis humilis*	Alpine Bentgrass
AGID	AGID	*Agrostis idahoensis*	Idaho Bentgrass
AGIN	AGIN5	*Agropyron inerme*	Beardless Bluebunch Wheatgrass
AGIN2	AGIN2	*Agropyron intermedium*	Intermediate Wheatgrass
AGRE	AGRE2	*Agropyron repens*	Quack Grass
AGROS	AGROS2	*Agrostis* spp.	Bentgrass
AGSC	AGSC5	*Agrostis scabra*	Winter Bentgrass or Ticklegrass

PERENNIAL GRASSES (cont.)

R6 CODE	*PLANTS CODE*	*SCIENTIFIC NAME*	*COMMON NAME*
AGSP	AGSP	*Agropyron spicatum*	Wheatgrass
AGTH	AGTH2	*Agrostis thurberiana*	Thurber Bentgrass
ALAE	ALAE	*Alopecurus aequalis*	Shortawn Foxtail*R6*
ALPR	ALPR3	*Alopecurus pratensis*	Meadow Foxtail
AREL	AREL3	*Arrhenatherum elatius*	Tall Oatgrass
BRCA	BRCA5	*Bromus carinatus*	Mountain Brome
BRCAC	no code	*Bromus carinatus carinatus*	Mountain Brome
BRCAL	BRCAL2	*Bromus carinatus linearis*	Mountain Brome
BRCI	BRCI2	*Bromus ciliatus*	Fringed Brome
BRIN	BRIN2	*Bromus inermis*	Smooth Brome
BROMU	BROMU	*Bromus* spp.	Brome
BROR	BROR2	*Bromus orcuttianus*	Orcutt Brome
BRPA	BRPA3	*Bromus pacificus*	Pacific Brome
BRVU	BRVU	*Bromus vulgaris*	Columbia Brome
BRVUV	no code	*Bromus vulgaris vulgaris*	Columbia Brome
CACA	CACA4	*Calamagrostis canadensis*	Bluejoint Reedgrass
CACAC2	CACAC10	*Calamagrostis canadensis canadensis*	Bluejoint Reedgrass
CACAP	CACAP4	*Calamagrostis canadensis pallida*	Bluejoint Reedgrass
CAIN	CAIN	*Calamagrostis inexpansa*	Northern Reedgrass
CALAM	CALAM	*Calamagrostis* spp.	Pinegrass or Reedgrass
CARU	CARU	*Calamagrostis rubescens*	Pinegrass
CILA2	CILA2	*Cinna latifolia*	Drooping Woodreed
DACA	DACA3	*Danthonia californica*	California Oatgrass
DAGL	DAGL	*Dactylis glomerata*	Orchard Grass
DAIN	DAIN	*Danthonia intermedia*	Timber Oatgrass
DANTH	DANTH	*Danthonia* spp.	Oatgrass
DAUN	DAUN	*Danthonia unispicata*	One-spike Oatgrass
DEAT	DEAT2	*Deschampsia atropurpurea*	Mountain Hairgrass
DECE	DECE	*Deschampsia cespitosa*	Tufted Hairgrass
DECEC	DECEC	*Deschampsia cespitosa cespitosa*	Tufted Hairgrass
DEEL	DEEL	*Deschampsia elongata*	Slender Hairgrass
DESCH	DESCH	*Deschampsia* spp.	Hairgrass
ELCI	ELCI2	*Elymus cinereus*	Great Basin Wildrye
ELGL	ELGL	*Elymus glaucus*	Blue Wildrye
ELGLG	ELGLG	*Elymus glaucus glaucus*	Blue Wildrye
ELGLJ	ELGLJ	*Elymus glaucus jepsoni*	Blue Wildrye
FEAR3	FEAR3	*Festuca arundinacea*	Tall Fescue
FEID	FEID	*Festuca idahoensis*	Idaho Fescue
FEOC	FEOC	*Festuca occidentalis*	Western Fescue
FEOV	FEOV	*Festuca ovina*	Sheep Fescue
FEPR	FEPR	*Festuca pratensis*	Meadow Fescue
FERU	FERU2	*Festuca rubra*	Red Fescue
FERUR	FERUR2	*Festuca rubra rubra*	Red Fescue
FESTU	FESTU	*Festuca* spp.	Fescue
FESU	FESU	*Festuca subulata*	Bearded or Nodding Fescue
GLBO	GLBO	*Glyceria borealis*	Northern Mannagrass
GLEL	GLEL	*Glyceria elata*	Tall Mannagrass
GLGR	GLGR	*Glyceria grandis*	American Mannagrass
GLST	GLST	*Glyceria striata*	Fowl Mannagrass
GLYCE	GLYCE	*Glyceria* spp.	Mannagrass
HIOD	HIOD	*Hierochloe odorata*	Holy Grass or Seneca Grass
HOBR	HOBR2	*Hordeum brachyantherum*	Meadow Barley
KOCR	KOCR	*Koeleria cristata*	Prairie Junegrass
MEBU	MEBU	*Melica bulbosa*	Oniongrass
MESP	MESP	*Melica spectabilis*	Showy or Purple Oniongrass
MESU	MESU	*Melica subulata*	Alaska Oniongrass
MESUS	MESUS	*Melica subulata subulata*	Alaska Oniongrass
MUFI	MUFI2	*Muhlenbergia filiformis*	Slender Muhly
PHAL	PHAL2	*Phleum alpinum*	Alpine Timothy
PHAR	PHAR3	*Phalaris arundinacea*	Reed Canarygrass
PHPR	PHPR3	*Phleum pratense*	Common Timothy
POA	POA	*Poa* spp.	Bluegrass
POBU	POBU	*Poa bulbosa*	Bulbous Bluegrass
POCA	POCA	*Poa canbyi*	Canby Bluegrass
POCO	POCO	*Poa compressa*	Canada Bluegrass

PERENNIAL GRASSES (cont.)

R6 CODE	PLANTS CODE	SCIENTIFIC NAME	COMMON NAME
POCU	POCU3	*Poa cusickii*	Cusick's Bluegrass
POLE	POLE2	*Poa leptocoma*	Bog Bluegrass
POLEL	POLEL	*Poa leptocoma leptocoma*	Bog Bluegrass
PONE2	PONE3	*Poa nevadensis*	Nevada Bluegrass
PONE5	PONE	*Poa nemoralis*	Woods Bluegrass
POPA	POPA2	*Poa palustris*	Fowl Bluegrass
POPR	POPR	*Poa pratensis*	Kentucky Bluegrass
POSA3	POSA12	*Poa sandbergii*	Sandberg's Bluegrass
POSC	POSC	*Poa scabrella*	Rough Bluegrass
POTR3	POTR2	*Poa trivialis*	Roughstalk Bluegrass
PUPA	PUPA3	*Puccinellia pauciflora*	Weak Alkaligrass
PUPAM	PUPAM2	*Puccinellia pauciflora microtheca*	Weak Alkaligrass
SIHY	SIHY	*Sitanion hystrix*	Bottle-brush Squirreltail
STIPA	STIPA	*Stipa* spp.	Needlegrass
STOC	STOC2	*Stipa occidentalis*	Western Needlegrass
STOCM	STOCM	*Stipa occidentalis minor*	Western Needlegrass
TRCA	TRCA21	*Trisetum canescens*	Tall Trisetum
TRWO	TRWO3	*Trisetum wolfii*	Wolf's Trisetum

SEDGES, RUSHES AND SPIKERUSHES

R6 CODE	PLANTS CODE	SCIENTIFIC NAME	COMMON NAME
CAAM	CAAM10	*Carex amplifolia*	Big-leaved Sedge
CAAP3	CAAP3	*Carex aperta*	Columbia Sedge
CAAQ	CAAQ	*Carex aquatilis*	Water Sedge
CAAT	CAAT3	*Carex athrostachya*	Slender-beaked Sedge
CAAU	CAAU3	*Carex aurea*	Golden Sedge
CABA	CABA3	*Carex backii*	Back's Sedge
CACA4	CACA11	*Carex canescens*	Silvery Sedge
CACO	CACO11	*Carex concinnoides*	Northwest Sedge
CACU2	CACU5	*Carex cusickii*	Cusick's Sedge
CADE	CADE9	*Carex deweyana*	Dewey's Sedge
CADI	CADI6	*Carex disperma*	Soft-leaved Sedge
CADO	CADO2	*Carex douglasii*	Douglas' Sedge
CAFI	CAFI	*Carex filifolia*	Thread-leaf Sedge
CAGE	CAGE2	*Carex geyeri*	Elk Sedge
CAHE	CAHE7	*Carex hendersoni*	Henderson's Sedge
CAHO	CAHO5	*Carex hoodii*	Hood's Sedge
CAIL	CAIL	*Carex illota*	Sheep Sedge
CAIN5	CAIN11	*Carex interior*	Inland Sedge
CAJO	CAJO	*Carex jonesii*	Jones' Sedge
CALA	CALA13	*Carex laeviculmis*	Smooth-stemed Sedge
CALA3	CALA30	*Carex lanuginosa*	Woolly Sedge
CALA4	CALA11	*Carex lasiocarpa*	Slender Sedge
CALE3	CALE9	*Carex leporinella*	Sierra-hare Sedge
CALE5	CALE8	*Carex lenticularis*	Densely-tufted Sedge
CALEL2	CALEL	*Carex lenticularis lenticularis*	Densely-tufted Sedge
CALI3	CALI6	*Carex limnophila*	Pond Sedge
CALU	CALU7	*Carex luzulina*	Woodrush Sedge
CAMI	CAMI7	*Carex microptera*	Small-winged Sedge
CAMU2	CAMU7	*Carex muricata*	Muricate or Star Sedge
CANE	CANE2	*Carex nebraskensis*	Nebraska Sedge
CANE2	CANE6	*Carex neurophora*	Alpine-nerved Sedge
CANI2	CANI2	*Carex nigricans*	Black Alpine Sedge
CANU4	CANU5	*Carex nudata*	Torrent Sedge
CAPA	CAPA14	*Carex pachystachya*	Thick-headed Sedge
CAPE	CAPE7	*Carex petasata*	Liddon's Sedge
CAPH	CAPH2	*Carex phaeocephala*	Dun-head or Mountain Hare Sedge
CAPR	CAPR7	*Carex praticola*	Meadow Sedge
CAPR5	CAPR5	*Carex praegracilis*	Clustered Field Sedge
CARA	CARA6	*Carex raynoldsii*	Raynold's Sedge
CAREX	CAREX	*Carex* spp.	Sedge
CARO	CARO5	*Carex rossii*	Ross' Sedge

SEDGES, RUSHES AND SPIKERUSHES (cont.)

R6 CODE	PLANTS CODE	SCIENTIFIC NAME	COMMON NAME
CARO2		*Carex rostrata*	Beaked Sedge = Bladder Sedge
=CAUT		= *Carex utriculata*	
CASC3	CASC10	*Carex scirpoidea*	Canada Single-spike Sedge
CASC5	CASC12	*Carex scopulorum*	Holm's Rocky Mountain Sedge
CASH	CASH	*Carex sheldonii*	Sheldon's sedge
CASI2	CASI2	*Carex simulata*	Short-beaked Sedge
CASI3	CASI3	*Carex sitchensis*	Sitka Sedge
CAST	CAST5	*Carex stipata*	Saw-beak Sedge
CAUT	CAUT	*Carex utriculata*	Bladder sedge
CAVE	CAVE6	*Carex vesicaria*	Inflated Sedge
CAVEV	CAVEV2	*Carex vesicaria vesicaria*	Inflated Sedge
ELAC	ELAC	*Eleocharis acicularis*	Needle Spike-rush
ELBE	ELBE	*Eleocharis bella*	Delicate Spike-rush
ELEOC	ELEOC	*Eleocharis* spp.	Spike-rush
ELPA	ELPA3	*Eleocharis palustris*	Common or Creeping Spike-rush
ELPA2	ELPA6	*Eleocharis pauciflora*	Few-flowered Spike-rush
ERGR2	ERGR8	*Eriophorum gracile*	Slender Cotton-grass
JUAC	JUAC	*Juncus acuminatus*	Tapered Rush
JUAL	JUAL	*Juncus alpinus*	Northern Rush
JUAR	JUAR4	*Juncus articulatus*	Jointed Rush
JUBA	JUBA	*Juncus balticus*	Baltic Rush
JUBAB	JUBAB	*Juncus balticus balticus*	Baltic Rush
JUBR	JUBR3	*Juncus brachyphyllus*	Short-leaved Rush
JUCO	JUCO2	*Juncus confusus*	Colorado Rush
JUDR	JUDR	*Juncus drummondii*	Drummond's Rush
JUEF	JUEF	*Juncus effusus*	Soft Rush
JUEN	JUEN	*Juncus ensifolius*	Sword-leaf Rush
JUENE	no code	*Juncus ensifolius ensifolius*	Sword-leaf Rush
JUENM	JUENM2	*Juncus ensifolius montanus*	Sword-leaf Rush
JUHO	JUHO	*Juncus howellii*	Howell's Rush
JULO	JULO	*Juncus longistylis*	Long-styled Rush
JUME	JUME3	*Juncus mertensianus*	Merten's Rush
JUNCU	JUNCU	*Juncus* spp.	Rush
JUNE	JUNE	*Juncus nevadensis*	Sierra Rush
JUNEN	JUNEN	*Juncus nevadensis nevadensis*	Sierra Rush
JUNO	JUNO2	*Juncus nodosus*	Tuberous Rush
JUOR	JUOR	*Juncus orthophyllus*	Straight-leaved Rush
JUPA	JUPA	*Juncus parryi*	Parry's Rush
JURE	JURE	*Juncus regelii*	Regel's Rush
JUTE	JUTE	*Juncus tenuis*	Slender Rush
LUCA2	LUCA2	*Luzula campestris*	Field Woodrush
LUCAM	LUCAM3	*Luzula campestris multiflora*	Field Woodrush
LUDI	LUDI	*Luzula divaricata*	Spreading Woodrush
LUPA	LUPA4	*Luzula parviflora*	Small-flowered Woodrush
LUZUL	LUZUL	*Luzula* spp.	Woodrush
SCMI	SCMI2	*Scirpus microcarpus*	Panicled Bulrush

FERNS AND HORSETAILS

R6 CODE	PLANTS CODE	SCIENTIFIC NAME	COMMON NAME
ADPE	ADPE	*Adiantum pedatum*	Maidenhair Fern
ATFI	ATFI	*Athyrium filix-femina*	Lady Fern
BOMU	BOMU	*Botrychium multifidum*	Leathery Grapefern
CYFR	CYFR2	*Cystopteris fragilis*	Brittle Bladderfern
DRAU2	DRAU8	*Dryopteris austriaca*	Spreading Woodfern
DRFI	DRFI2	*Dryopteris filix-mas*	Male Fern
EQAR	EQAR	*Equisetum arvense*	Common or Field Horsetail
EQHY	EQHY	*Equisetum hyemale*	Common Scouringrush
EQLA	EQLA	*Equisetum laevigatum*	Smooth Horsetail
EQUIS	EQUIS	*Equisetum* spp.	Horsetail
EQVAV	EQVAV	*Equisetum variegatum variegatum*	Northern Scouringrush
GYDR	GYDR	*Gymnocarpium dryopteris*	Oak Fern
POAN3	POAN2	*Polystichum andersonii*	Anderson's Swordfern
POMU	POMU	*Polystichum munitum*	Sword Fern
PTAQ	PTAQ	*Pteridium aquilinum*	Bracken Fern
WOOR	WOOR	*Woodsia oregana*	Oregon or Western Woodsia

R6 CODE	*PLANTS CODE*	*SCIENTIFIC NAME*	*COMMON NAME*
ANNUAL AND BIENNIAL FORBS			
CISC	CISC2	*Cirsium scariosum*	Elk Thistle
CIRSI	CIRSI	*Cirsium* spp.	Thistle
CIVU	CIVU	*Cirsium vulgare*	Bull or Common Thistle
CLRH	CLRH	*Clarkia rhomboidea*	Common Clarkia
COLI	COLI	*Collinsia linearis*	Blue-eyed Mary
COPA	COPA3	*Collinsia parviflora*	Small-flowered Blue-eyed Mary
COLLI	COLLI	*Collinsia* spp.	Blue-eyed Mary
COGR2	COGR4	*Collomia grandiflora*	Large-flowered Collomia
COLI2	COLI2	*Collomia linearis*	Narrow-leaf Collomia
COLLO	COLLO	*Collomia* spp.	Collomia
DERIV	DERIV2	*Descurainia richardsonii viscosa*	Mountain Tansymustard
EPMI	EPMI	*Epilobium minutum*	Small-flowered Willow-herb
EPPA	EPPA	*Epilobium paniculatum*	Tall Annual Willow-herb
GAAP	CAAP2	*Galium aparine*	Catchweed Bedstraw or Cleavers
GABI	GABI	*Galium bifolium*	Thin-leaf Bedstraw
GESI	GESI6	*Gentiana simplex*	One-flowered Gentian
GEMO	GEMO	*Geranium molle*	Dove-foot Geranium
LASE	LASE	*Lactuca serriola*	Prickly Lettuce
LOPU	LOPU3	*Lotus purshianus*	Spanish Clover
MAGL	MAGL2	*Madia glomerata*	Cluster Tarweed
MAGR	MAGR3	*Madia gracilis*	Common or Slender Tarweed
MADIA	MADIA	*Madia* spp.	Tarweed
MOLI	MOLI4	*Montia linearis*	Line-leaf Indian-lettuce
MOPE	MOPE3	*Montia perfoliata*	Miners-lettuce
NEBR	NEBR	*Nemophila breviflora*	Great Basin Nemophila
ORTHO	ORTHO	*Orthocarpus* spp.	Owlclover
TRDU	TRDU	*Tragopogon dubius*	Yellow Salsify
TRCY	TRCY	*Trifolium cyathiferum*	Cup Clover
TRMI	TRMI4	*Trifolium microcephalum*	Woolly or Smallheaded Clover
VETH	VETH	*Verbascum thapsus*	Common or Flannel Mullein
VEAR	VEAR	*Veronica arvensis*	Common Speedwell
ANNUAL AND BIENNIAL GRASSES			
BRMO	BRMO2	*Bromus mollis*	Soft Brome
BRSE	BRSE	*Bromus secalinus*	Ryebrome
BRTE	BRTE	*Bromus tectorum*	Cheatgrass or Downy Chess
DEDA	DEDA	*Deschampsia danthonioides*	Annual Hairgrass

APPENDIX C. PLANT SPECIES COVER AND FORAGE VALUES FOR ANIMALS

Subset of species taken from table in Appendix X for which information found.
** = taken from Hansen and others 1995.
# = taken from Steele and Geier-Hayes 1989 and Hansen and others 1995.
* = based on local observation of browse use or species height.
Thermal and Feeding Cover Value: **G** (Good) = readily utilized for cover when available; **F** (Fair) = moderately utilized for cover when available; **P** (Poor) = rarely or never utilized for cover when available.
Forage Values: **G** (Good) = readily to moderately available in the plant's range and consumed to a high degree; **F** (Fair) = readily to moderately available in the plant's range but consumed only to a moderate degree; **P** (Poor) = available but the plant is consumed to only a small degree or not at all.

R6 CODE	SCIENTIFIC NAME	COVER/FORAGE VALUES **						FORAGE VALUES	
		Elk	Mule Deer	Upland Game Birds	Waterfowl	Small non-Game Birds	Small Mammals	Antelope*	Livestock#
	TREES								
ABGR	*Abies grandis*	----	----	----	----	----	----	–	P
ABLA2	*Abies lasiocarpa*	F/P	F/P	G/F	P/P	F/P	G/F	P	P
ALRH	*Alnus rhombifolia*	----	----	----	----	----	----	–	P
ALRU	*Alnus rubra*	----	----	----	----	----	----	–	P
PIEN	*Picea engelmannii*	G/P	G/P	G/F	P/P	G/G	G/G	P	P
PICO	*Pinus contorta*	G/P	G/P	G/G	P/P	G/P	G/P	P	P
PIPO	*Pinus ponderosa*	G/P	G/P	G/G	P/P	G/G	G/G	P	P
POTR	*Populus tremuloides*	G/F	G/F	G/G	F/F	G/G	G/G	P	F
POTR2	*Populus trichocarpa*	F/P	F/P	F/G	F/F	G/G	G/G	P	F
PSME	*Pseudotsuga menziesii*	G/P	G/F	G/G	P/P	G/P	G/F	P	P
	SHRUBS								
ACGL	*Acer glabrum*	F/F	F/G	F/F	F/P	F/F	F/F	P	P
ALIN	*Alnus incana*	F/P	F/P	F/F	G/P	F/G	F/P	P	P
ALSI	*Alnus sinuata*	----	----	----	----	----	----	--	M-H
AMAL	*Amelanchior alnifolia*	P/F	F/G	F/F	G/P	F/F	F/F	G	F
ARCA	*Artemisia cana*	P/F	F/F	F/F	G/P	G/F	G/F	F*	F
ARTR	*Artemisia tridentata*	----	----	----	----	----	----	G*	F
BEGL	*Betula glandulosa*	P/P	P/P	F/F	G/P	F/F	F/F	P	P
BEOC	*Betula occidentalis*	F/F	G/P	G/G	G/F	G/F	G/G	F	P
COST	*Cornus stolonifera*	F/P	F/G	F/F	F/F	F/F	F/F	F	F
CRDO	*Crataegus douglasii*	F/F	G/F	F/F	F/P	F/F	F/F	F	F
KAMI	*Kalmia microphylla*	F/P	F/P	P*/-	P/-	F/-	F/-	P	P
LIBO2	*Linnaea borealis*	----	----	----	----	----	----	–	P
LOUT2	*Lonicera utahensis*	F/-	F/-	F/F	P/F	F/G	P/F	–	P
PHCA	*Physocarpus malvaceous*	----	----	----	----	----	----	–	L-M
POFR	*Potentilla fruticosa*	P/F	P/F	F/P	P/P	P/F	P/F	P	P
PRVI	*Prunus virginiana*	F/F	G/G	G/G	G/P	G/G	G/G	P	F
RILA	*Ribes lacustre*	P/G	F/F	G/G	G/F	G/G	G/G	P	–
ROWO	*Rosa woodsii*	F/F	G/F	F/G	G/P	F/G	F/G	G	F
RUPA	*Rubus parviflorus*	-/P	-/P	-/F	-/P	-/F	-/F	P	P
SABE	*Salix bebbiana*	G/G	G/F	G/G	F/F	G/G	G/G	F	F
SABO2	*Salix boothii*	G/F	G/F	G/G	F/F	G/G	G/G	F	F
SAEXE	*Salix exigua* ssp. *exigua*	G/G	G/G	G/G	G/F	G/G	G/G	F	F
SAEXM	*Salix exigua* ssp. *melanopsis*	G/G	G/G	G/G	G/F	G/G	G/G	F	F
SAGE	*Salix geyeriana*	G/G	G/F	G/G	F/F	G/G	G/G	F	G
SALA2	*Salix lasiandra*	G/-	G/-	G/-	F/-	G/-	G/-	–	F
SARI	*Salix rigida*	G/G	G/F	G/G	F/F	G/G	G/G	P	--
SASC	*Salix scouleriana*	----	----	----	----	----	----	–	P
SPBE	*Spiraea betulifolia*	P/P	P/F	P/P	G/P	P/P	P/P	F	L-M
SYAL	*Symphoricarpos albus*	P/F	F/F	G/F	G/F	G/F	G/F	F	F
VAME	*Vaccinium membranaceum*	----	----	----	----	----	----	P	–
VASC	*Vaccinium scoparium*	P/P	P/P	P/F	G/P	P/P	P/P	P	P

R6 CODE	SCIENTIFIC NAME	Elk	Mule Deer	Upland Game Birds	Waterfowl	Small non-Game Birds	Small Mammals	Antelope*	Livestock#
		COVER/FORAGE VALUES*						FORAGE VALUES	
	GRASSLIKES								
CAAQ	Carex aquatilis	P/F	P/F	P/P	F/F	F/F	F/F	P	G
CAGE	Carex geyeri	----	----	----	----	----	----	--	F
CALA3	Carex lanuginosa	P/F	P/F	P/F	F/F	F/F	F/F	F	G
CALA4	Carex lasiocarpa	P/P	P/P	P/F	F/F	F/F	F/F	P	P
CALE5	Carex lenticularis	P/-	P/-	P/-	F/-	F/-	F/-	--	--
CAMI	Carex microptera	----	----	----	----	----	----	--	P
CANE	Carex nebrascensis	P/F	P/F	P/P	F/G	F/G	G/G	P	F
CASC5	Carex scopulorum	P/-	P/-	----	----	----	----	--	F
CASI2	Carex simulata	----	----	----	----	----	----	--	P
CAUT	Carex utriculata	P/F	P/F	P/F	P/F	F/G	F/G	P	F
CAVE	Carex vesicaria	P/F	P/P	P/F	P/F	F/G	F/G	P	F
ELPA	Eleocharis palustris	P/F	P/F	F/P	G/G	F/F	F/F	P	P
ELPA2	Eleocharis pauciflora	P/F	PF	F/P	P*/G	FF	FF	P	P
JUBA	Juncus balticus	P/F	P/P	F/G	G/G	F/F	F/F	P	F
SCMI	Scirpus microcarpus	----	----	----	----	----	----	--	F
	GRASSES								
AGST	Agrostis stolonifera	P/G	P/G	G/F	G/F	F/F	F/F	P	F
CACA	Calamagrostis canadensis	P/F	P/P	P/P	G/G	P/P	P/P	P	F
CARU	Calamagrostis rubescens	P/P	P/P	F/-	G/-	P/-	P/-	P	P
DECE	Deschampsia cespitosa	P/G	P/F	P/F	G/G	P/P	P/P	F	F
ELGL	Elymus glaucus	P/G	P/G	----	----	----	----	P	G
GLEL	Glyceria elata	----	----	----	----	----	----	--	G
GLST	Glyceria striata	P/F	P/F	F/F	G/F	G/F	G/G	P	G
PHAL	Phleum alpinum	----	----	P/-	F/-	P/-	P/-	--	G
PHPR	Phleum pratense	P/F	P/F	F/F	G/G	F/F	F/F	P	G
POPA	Poa palustris	P/G	P/G	-/F	-/F	-/F	-/F	F	F
POPR	Poa pratensis	P/G	P/F	G/F	G/G	G/F	G/F	F	G
STOC	Stipa occidentalis	P/G	P/P	----	----	----	----	P	F
	FORBS								
ACMI	Achillea millefolium	P/P	P/F	P/P	P/P	P/P	P/P	P	P
ACRU	Actaea rubra	P/F	P/F	P/P	----	P/F	P/F	P	P
ARCO	Arnica cordifolia	P/F	P/F	P/P	P/P	P/P	P/P	F	P
ASFO	Aster foliaceous	P/G	P/G	P/F	P/F	P/G	P/G	F	F
CIAR	Cirsium arvense	P/P	P/F	P/F	P/P	P/F	P/P	P	P
EPGL2	Epilobium glandulosum	P/-	P/-	----	----	----	----	--	--
EQAR	Equisetum arvense	P/P	P/P	P/P	F/P	F/P	F/P	P	P
FRVI	Fragaria virginiana	P/F	P/G	P/P	P/P	P/P	P/F	P	P
GABO	Galium boreale	P/P	P/F	P/P	P/P	P/P	P/P	P	P
GATR	Galium triflorum	P/P	P/P	P/P	P/P	P/P	P/P	P	--
GEVI	Geranium viscossisimum	P/G	P/G	P/F	P/P	P/F	P/F	P	F
HELA	Heracleum lanatum	----	----	----	----	----	----	--	G
MECI	Mertensia ciliata	P/P	P/P	F/F	F/P	F/F	F/F	P	F
OSCH	Osmorhiza chilensis	----	----	P/F	P/F	P/G	P/G	--	F
PAFI	Parnassia fimbriata	P/F	P/F	----	----	----	----	P	--
POBI	Polygonum bistortoides	P/-	P/-	P/P	P/P	P/P	P/P	--	P
POGR	Potentilla gracilis	P/P	P/P	----	----	----	----	P	P
SETR	Senecio triangularis	P/G	P/F	P/F	F/P	F/G	F/G	P	F
SMST	Smilacina stellata	P/P	P/F	P/F	P/P	P/F	P/F	P	P
TAOF	Taraxacum officinale	P/G	P/F	P/G	P/F	P/F	P/F	G	F
THOC	Thalictrum occidentalis	P/F	P/F	----	----	----	----	P	P
TRRE	Trifolium repens	P/P	P/P	P/G	P/F	P/F	P/F	P	G
TYLA	Typha latifolia	P/P	F/P	G/G	G/G	G/G	G/G	P	P

APPENDIX D. SPECIES CHARACTERISTICS

Indicator Species - whether the species is an indicator species for a particular plant association or community type in this classification.

Hydrophyte Status - this is a category assigned by the U.S. Fish and Wildlife Service for plant species in Oregon. It would be used by managers primarily for determination of jurisdictional wetlands and well as give a general idea of how changes in water table might affect particular species. Category assignments in **bold** type are for species that ARE NOT in the 1988 USFW list. The author has assigned a status to help managers, but these assignments are not meant for the legal purposes of jurisdictional wetland identification or assignment. **OBL** (Obligate Wetland) refers to species that almost always occur (estimated probability >99%) under natural conditions in wetlands; **FACW** (Facultative Wetland) refers to species that usually occur in wetlands (estimated probability 67%-99%) but occasionally are found in nonwetlands; **FAC** (Facultative) refers to plants that are equally likely to occur in wetland or nonwetlands (estimated probability 34%-66%); **FACU** (Facultative Upland) refers to plants usually occurring in nonwetlands (estimated probability 67%-99%) but occasionally found in wetlands (estimated probability 1%-33%); **UPL** (Obligate upland) refers to plants that occur almost always (estimated probability >99%) under natural conditions in nonwetlands. In addition, + (positive) and - (negative) signs are occasionally used with the FACW, FAC and FACU categories. The positive (+) sign indicates a frequency toward the higher end of the category (i.e. more frequently found in wetlands) and the negative (-) sign indicates a frequency toward the lower end of the category (less frequently found in wetlands).

Rooting Habit - this information is meant to give manager who is assessing a site for management purposes and wants to have some idea about the ability of species to withstand ground disturbance (animals, machines, camping, etc.) as well as the ability to help bind soil, to increase or decrease under change or disturbance. And the species expected ability to appear and increase in abundance whether through natural or human revegetation. All species in table below are perennial except *Cirsium vulgare* (biennial) and *Montia perfoliata* (annual). Terms used are defined in the Glossary (Appendix A).

Streambank Stability - is a relative value assigned by the author.

Potential Biomass (taken from Hansen and others 1995) "refers to the relative genetic ability of a plant to produce plant material by weight on an annual basis ***compared to another member of the same lifeform*** (e.g. grass is rated against other grasses). Species are rated as if they were growing on typical sites. Therefore, a plant may have a higher or lower biomass than the rating given if it occurs on a site more favorable or less favorable than its normal site. **H** (High) = plant possesses ability to produce a greater yield of dry plant material than most other species of the same lifeform; **M** (Medium) = plant produces an average yield of dry plant material as compared to other species of the same lifeform; **L** (Low) = plant produces a low yield of dry plant material as compared to other species of the same lifeform."

Erosion Control (taken from Hansen and others 1995) "refers to a plant that commonly exhibits growth habit, plant structure, biomass and/or root system that has the potential to reduce soil erosion. **H** (High) = plant that has aggressive growth habits, persistent plant structure, high potential biomass, and/or good soil-binding root-rhizome-runner system in established stands; **M** (Medium) = plant that has moderately aggressive growth, moderately persistent plant structure, moderate potential biomass, and/or moderate soilbinding root-rhizome-runner system in established stands **L** (Low) = plant has poor growth, persistence, biomass, and/or soil-binding root system that makes it generally inadequate for erosion control."

Short-term Revegetation (taken from Hansen and others 1995) "refers to the ability of a plant to become quickly established and exhibit rapid growth with 1 to 3 years. **H** (High) = plant demonstrates rapid growth, good cover and good reproduction; **M** (Medium) = plant demonstrates moderately rapid growth, fair cover and fair reproduction; **L** (Low) = plant demonstrates slow growth, poor cover and poor reproduction."

Long-term Revegetation (taken from Hansen and others 1995) "refers to the ability of the plant to become established and persist over a period of more than 3 years. **H** (High) = plant demonstrates good growth, cover, reproduction and stand maintenance characteristics; **M** (Medium) = plant demonstrates fair growth, cover, reproduction and stand maintenance characteristics; **L** (Low) = plant demonstrates poor growth, cover, reproduction and stand maintenance characteristics."

Reason(s) for Increase/Decrease in Abundance - These are general observations by authors only; they are **not** based on experimental data. These observations are meant to give managers an idea of what the causes of abundance increase and decrease might be and to stimulate monitoring/observation of particular species of interest. The increase/decrease causes given below may be useful in carrying out the Proper Functioning Condition Assessment, in developing or changing livestock allotment management plans, in carrying out watershed assessments and/or in other planning activities. Terms used: **Grazing** - effects of eating and hoof action of grazing mammals; **Overgrazing** - grazing effects that are damaging to vegetation, soils and/or hydrology of site; **Overbrowsing** - amount of browsing of woody plants that causes decline in vigor and reproduction; **Ground Disturbance** - disturbance of low-growing plants (e.g. graminoids and forbs) or soils by animals (e.g. burrowing, grazing), machinery (trucks, tractors, off-road vehicles, etc.), heavy or repeated camping or trampling by human, skidding of logs and/ or other disturbance agents.

R6 Code	Scientific Name	Ind. Sp.	Hydro. Status	Rooting Habit	Strmbnk Stability	Poten. Biom.	Eros. Cont.	Short-Reveg.	Long Reveg	Reason (s) for Increase in Abundance	Reason(s) for Decr. in Abundance
	TREES										
ABGR	*Abies grandis*	Y	FACU	dry sites-deep taproot; wet sites-shallow lateral	Fair	--	--	--	--	Increase in understory; shade, moisture; lack of fire	Fire; insects; disease
ABLA2	*Abies lasiocarpa*	Y	FACU	shallow lateral system	Fair	H	M	L	M	Lack of fire	Fire; insects; disease
ALRH	*Alnus rhombifolia*	Y	FACW	fibrous	Good	--	--	--	--	Coarse flood deposition	-----
ALRU	*Alnus rubra*	Y	FAC	extensive fibrous	Good					Coarse flood deposition	-----
PIEN	*Picea engelmannii*	Y	FAC	shallow, lateral system	Fair	H	M	L	M	Increase in understory	Fire; insects; disease shade, moisture
PICO	*Pinus contorta*	Y	FAC-	generally shallow	Fair	H	L	L	M	Fire	Insects
PIPO	*Pinus ponderosa*	Y	FACU-	deep taproots with extensive laterals	Fair	H	M	L	M	Opening of canopy; periodic underburning	Insects
POTR	*Populus tremuloides*	Y	FAC+	rhizomatous	Good	M	H	L	H	Warming of soil; fire	Overbrowsing; lack of fire; closing of coniferous canopy
POTR2	*Populus trichocarpa*	Y	FAC	shallow, widespread system	Good	H	H	L	M	Flood deposition	Overbrowsing; loss of flood deposition and scour area
PSME	*Pseudotsuga menziesii*	Y	FACU	dry sites-deep taproot; wet sites-shallow lateral	Fair	H	M	L	H	Opening of canopy; lack of fire	Fire; insects
	SHRUBS										
ACGL	*Acer glabrum*	Y	FAC	large root crowns, deep root system	Fair	M	M	L	M	Opening of conifer canopy	Closing of conifer canopy
ALIN	*Alnus incana*	Y	FACW	root crowns; somewhat rhizomatous?	Good	M	H	L	M	Coarse flood deposition and scour	Overbrowsing
ALSI	*Alnus sinuata*	Y	FACW	root crown; caudex	Good	--	--	--	--	Coarse flood deposition and scour	-----
AMAL	*Amelanchior alnifolia*	Y	FACU	rhizomatous	Fair	M	M	L	M	-----	-----
ARCA	*Artemisia cana*	Y	FAC	rhizomatous	Fair	M	M	L	M	Fire?	-----
ARTR	*Artemisia tridentata*	Y	UPL	branching caudex	Poor	--	--	--	--	Overgrazing; lack of fire	Fire
BEGL	*Betula glandulosa*	Y	OBL	root crown	Good	M	H	L	H	-----	Overbrowsing
BEOC	*Betula occidentalis*	Y	FACW	shallow, dense system	Good	M	H	L	M	-----	Overbrowsing
COST	*Cornus stolonifera*	Y	FACW	root crown; stoloniferous	Good	M	M	L	H	Coarse flood or road fill	Overbrowsing deposition along stream
CRDO	*Crataegus douglasii*	Y	FAC	root crown	Fair	M	M	L	M	Overgrazing	Fire?
KAMI	*Kalmia microphylla*	N	FACW+	rhizomatous?	Fair	L	M	L	M	-----	-----
LIBO2	*Linnaea borealis*	Y	FACU-	fibrous; stoloniferous	Poor	--	--	--	--	Increase in shade	-----
LOIN	*Lonicera involucrata*	N	FAC	root crown	Fair	--	--	--	--	-----	-----
LOUT2	*Lonicera utahensis*	N	FACU+	root crown	Fair	M	M	L	M	-----	-----
PHLE2	*Philadelphus lewisii*	N	FAC	root crown	Fair	--	--	--	--	-----	-----
PHEM	*Phyllodoce empetriformis*	N	FAC	--	Poor	--	--	--	--	-----	-----
PHCA3	*Physocarpus capitatus*	Y	FAC+	root crown	Good	--	--	--	--	-----	-----

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PHMA	*Physocarpus malvaceous*	Y	FACU	deep-rooted with crown	Good	--	--	--	--	Fire; decrease in tree canopy	Shading
POFR	*Potentilla fruticosa*	Y	FAC-	fibrous branching rootstocks, shallow to mod. deep	Good	H	M	L	M	-----	Overbrowsing
PRVI	*Prunus virginiana*	N	FACU	shallow rhizomes with deep feeder roots	Good	H	M	L	H	-----	-----
RHAL2	*Rhamnus alnifolia*	Y	FACU	rhizomatous?	Good	--	--	--	--	-----	-----
RIHU	*Ribes hudsonianum*	Y	OBL	rhizomatous?	Good					Flood deposition	-----
RIIR	*Ribes irriguum*	N	FAC	rhizomatous?	Good					-----	Overbrowsing
RILA	*Ribes lacustre*	Y	FAC+	rhizomatous?	Good	M	M	L	M	Flood deposition	Overbrowsing
RIWO	*Ribes wolfii*	N	FAC	rhizomatous?	Good	--	--	--	--	Flood deposition	Overbrowsing
ROGY	*Rosa gymnocarpa*	N	FAC	rhizomatous	Good	--	--	--	--	Ground disturbance	-----
RONU	*Rosa nutkana*	N	FAC	rhizomatous	Good	--	--	--	--	Ground disturbance	-----
ROWO	*Rosa woodsii*	N	FACU	rhizomatous	Good	M	H	L	M	Ground disturbance	-----
RUID	*Rubus idaeus*	N	FAC	root crown?	Poor	--	--	--	--	Ground disturbance	-----
RUPA	*Rubus parviflorus*	N	FACU+	rhizomatous	Fair	M	M	L	M	Ground disturbance	-----
SABE	*Salix bebbiana*	Y	FACW	root crown	Excellent	M	H	L	M	Flood deposition	Overbrowsing
SABO2	*Salix boothii*	Y	OBL	root crown	Excellent	H	H	L	M	Flood deposition	Overbrowsing
SACO2	*Salix commutata*	Y	OBL	root crown	Good	M	H	L	M	-----	Overbrowsing
SAEA	*Salix eastwoodiae*	Y	FACW	root crown	Good	--	--	--	--	-----	Overbrowsing
SAEXE	*Salix exigua* ssp. *exigua*	Y	OBL	rhizomatous	Excellent	M	H	L	M	Flood deposition	Overbrowsing
SAEXM	*Salix exigua* ssp. *melanopsis*	Y	OBL	rhizomatous	Excellent	M	H	L	M	Flood deposition	Overbrowsing
SAGE	*Salix geyeriana*	Y	FACW+	root crown	Excellent	H	H	L	M	Flood deposition	Overbrowsing
SALA2	*Salix lasiandra*	Y	FACW+	root crown	Excellent	H	H	L	M	Flood deposition	Overbrowsing
SARI	*Salix rigida*	Y	OBL	root crown	Excellent	H	H	L	M	Flood deposition	Overbrowsing
SASC	*Salix scouleriana*	Y	FAC	root crown	Good	--	--	--	--	-----	Closing of canopy
SPBE	*Spiraea betulifolia*	N	FAC-	strongly rhizomatous	Fair	M	M	L	M	Decrease in overstory shade	Increase in overstory shade
SYAL	*Symphoricarpos albus*	Y	FACU	rhizomatous	Good	M	M	L	M	Grazing; decrease in shade	Overbrowsing
TABR	*Taxus brevifolia*	N	FACU-	fibrous	Fair	--	--	--	--	Increase in understory shade and moisture	Fire; overbrowsing
VAME	*Vaccinium membranaceum*	Y	FACU+	not rhizomatous	Fair	--	--	--	--	Fire; decrease in canopy shade	Overbrowsing
VASC	*Vaccinium scoparium*	Y	FACU-	rhizomatous	Good	M	M	L	M	Fire	-----
VAUL	*Vaccinium uliginosum*	Y	FACW+	rhizomatous	Good	--	--	--	--	-----	-----
	SEDGES, RUSHES AND SPIKERUSHES										
CAAM	*Carex amplifolia*	Y	FACW+	rhizomatous	Excellent	--	--	--	--	Rise in water table	-----
CAAQ	*Carex aquatilis*	Y	OBL	rhizomatous	Excellent	H	H	M	M	Rise in water table	Overgrazing
CAAU	*Carex aurea*	N	FACW+	rhizomatous	Fair	--	--	--	--	-----	Overgrazing
CACA4	*Carex canescens*	Y	FACW+	caespitose-short to very short rhizomes	Good	--	--	--	--	-----	Overgrazing
CACU2	*Carex cusickii*	Y	OBL	caespitose	Excellent	--	--	--	--	Histic soil development	-----
CADE	*Carex deweyana*	Y	FACW+	caespitose	Fair	--	--	--	--	Flood deposition?	Overgrazing
CADI	*Carex disperma*	Y	FACW	caespitose	Fair	--	--	--	--	-----	Overgrazing
CADO	*Carex douglasii*	N	FAC-	rhizomatous	Good	--	--	--	--	-----	Overgrazing

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CAFI	*Carex filifolia*	N	**FACU**	caespitose	Poor	--	--	--	--	Grazing?	Overgrazing
CAGE	*Carex geyeri*	N	**UPL**	caespitose	Poor	--	--	--	--	Grazing	Overgrazing
CAHO	*Carex hoodii*	N	**FAC**	caespitose	Fair	--	--	--	--	Grazing	-----
CAJO	*Carex jonesii*	N	FACW+	caespitose	Fair	--	--	--	--	Grazing	-----
CALA	*Carex laeviculmis*	Y	FACW	caespitose	Fair	--	--	--	--	-----	-----
CALA3	*Carex lanuginosa*	Y	OBL	rhizomatous	Excellent	M	H	M	M	-----	Overgrazing
CALA4	*Carex lasiocarpa*	Y	OBL	rhizomatous	Excellent	M	H	M	M	Histic soil development	Overgrazing
CALE5	*Carex lenticularis*	Y	FACW+	caespitose	Good	H	H	M	M	-----	Overgrazing
CAMI	*Carex microptera*	N	FAC	caespitose	Good	--	--	--	--	Overgrazing	-----
CAMU2	*Carex muricata*	Y	OBL	caespitose	Good	--	--	--	--	-----	Overgrazing
CANE	*Carex nebrascensis*	Y	OBL	rhizomatous	Excellent	M	H	L	M	Heavy grazing	-----
CANU4	*Carex nudata*	Y	FACW	caespitose	Excellent	--	--	--	--	Coarse flood deposition	Overgrazing
CAPR5	*Carex praegracilis*	Y	FACW	rhizomatous	Excellent	--	--	--	--	-----	-----
CASC5	*Carex scopulorum*	Y	FACW	rhizomatous	Excellent	M	H	L	M	Rise in water table	-----
CASH	*Carex sheldonii*	Y	OBL	rhizomatous	Excellent	--	--	--	--	-----	-----
CASI2	*Carex simulata*	Y	OBL	rhizomatous	Excellent	--	--	--	--	-----	-----
CAST	*Carex stipata*	Y	OBL	caespitose	Fair	--	--	--	--	-----	-----
CAUT	*Carex utriculata*	Y	OBL	rhizomatous	Excellent	H	H	M	H	Increase in time/season of standing water	Overgrazing
CAVE	*Carex vesicaria*	Y	OBL	rhizomatous	Excellent	H	H			Increase in time/season of standing water	Overgrazing
ELBE	*Eleocharis bella*	Y	FACW	caespitose	Poor	--	--	--	--	-----	-----
ELPA	*Eleocharis palustris*	Y	OBL	rhizomatous	Excellent	M	H	H	M	Grazing?	Lowering of water table
ELPA2	*Eleocharis pauciflora*	Y	OBL	rhizomatous	Excellent	M	H*	H	M	Grazing on moist meadows	-----
JUBA	*Juncus balticus*	Y	OBL	rhizomatous	Excellent	M	M	L	M	Overgrazing	-----
JUEN	*Juncus ensifolius*	N	FACW	rhizomatous	Poor	--	--	--	--	Ground disturbance	-----
LUCA2	*Luzula campestris*	N	**FACW**	caespitose	Poor	--	--	--	--	Grazing	-----
SCMI	*Scirpus microcarpus*	Y	OBL	rhizomatous	Excellent	--	--	--	--	Grazing?	Overgrazing
	GRASSES										
AGST	*Agrostis stolonifera*	N	FAC+	rhizomatous	Fair	M	H*	H*	H*	Overgrazing?, seeding	-----
ALAE	*Alopecurus aequalis*	N	OBL	caespitose	Poor	--	--	--	--	-----	-----
ALPR	*Alopecurus pratensis*	N	FACW	rhizomatous	Fair	--	--	--	--	Seeding; grazing?	Rise in water table?
BRVU	*Bromus vulgaris*	N	FACU-	non-rhizomatous; fibrous	Poor	--	--	--	--	Overgrazing?	-----
CACA	*Calamagrostis canadensis*	Y	FACW+	rhizomatous	Excellent	M	H	L	H	Fine-textured flood deposition	Overgrazing
CARU	*Calamagrostis rubescens*	N	**FACU**	rhizomatous	Poor	M	M	L	M	Fire	Overgrazing; lack of fire
CILA2	*Cinna latifolia*	Y	FACW	rhizomatous	Fair	--	--	--	--	Flood deposition; grazing on fine-textured soils	-----
DAGL	*Dactylis glomerata*	N	FACU	caespitose	Poor	--	--	--	--	Seeding	-----
DECE	*Deschampsia cespitosa*	Y	FACW	caespitose	Fair	M	L	L	M	Lowering of water table in sedge communities?	Overgrazing
ELGL	*Elymus glaucus*	Y	FACU	rhizomatous	Fair	M	M	M	H	Grazing	-----
FEOC	*Festuca occidentalis*	N	**FACU**	caespitose	Poor	--	--	--	--	Grazing; ground disturbance	-----

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FERU	*Festuca rubra*	N	FAC	rhizomatous	Good	--	--	--	--	Seeding?	-----
FESU	*Festuca subulata*	N	FAC	caespitose	Fair	--	--	--	--	-----	-----
GLEL	*Glyceria elata*	Y	FACW+	rhizomatous	Fair	--	--	--	--	-----	Overgrazing
GLST	*Glyceria striata*	N	OBL	rhizomatous	Fair	L	M	L	M	-----	Overgrazing
MUFI	*Muhlenbergia filiformis*	N	FACW	rhizomatous	Fair	--	--	--	--	Grazing	-----
PHAL	*Phleum alpinum*	N	FAC	caespitose	Fair	M	M	L	M	-----	-----
PHPR	*Phleum pratense*	N	FACU	caespitose	Fair	M	M	M	H*	Seeding; grazing	-----
POCU	*Poa cusickii*	Y	FACU	caespitose	Fair	--	--	--	--	-----	Overgrazing
POPA	*Poa palustris*	N	FAC	stoloniferous; fibrous roots	Fair	M	M	M	M	Overgrazing	-----
POPR	*Poa pratensis*	Y	FACU+	rhizomatous	Poor	M	L	M	H	Overgrazing; lowering of water table; rodent activity	Raising of water table -prolonged soil saturation
PUPA	*Puccinellia pauciflora*	Y	OBL	rhizomatous	Poor	--	--	--	--	-----	Lowering of water table
STOC	*Stipa occidentalis*	N	UPL	caespitose	Fair	M	M	M	H	Overgrazing	-----
	FORBS										
ACMI	*Achillea millefolium*	N	FACU	often rhizomatous	Poor	L	L	H	M	Overgrazing; rodent activity	-----
ACCO	*Aconitum columbianum*	M*	FACW	short, thickened tuberous crown	Poor	--	--	--	--	-----	Trampling?
ACRU	*Actaea rubra*	N	FAC	root crown with fibrous roots?	Poor	M	L	L	L	-----	Trampling?
ADBI	*Adenocaulon bicolor*	M*	FAC	fibrous roots	Poor	--	--	--	--	-----	Trampling?
ADPE	*Adiantum pedatum*	Y	FAC	short, creeping, stout rhizome	Poor	--	--	--	--	-----	Trampling?
ALVA	*Allium validum*	N	OBL	rhizomatous; thickened iris-like rhizomes	Good	--	--	--	--	Grazing?	-----
ANMA	*Anaphalis margaritacea*	N	FACU	rhizomatous	Fair	--	--	--	--	Ground disturbance; grazing	-----
ANPI	*Anenome piperi*	N	FACU-	rhizomatous; deep-seated ascending rhizomes	Poor	--	--	--	--	-----	-----
ANAR2	*Angelica arguta*	Y	FACW	stout taproot	Fair	--	--	--	--	-----	Trampling?
ARCH	*Arnica chamissonis*	N	FACW	rhizomatous	Fair	--	--	--	--	Grazing?	-----
ARCO	*Arnica cordifolia*	N	FAC	rhizomatous	Poor	L	L	L	L	Grazing; fire	-----
ARLU	*Artemisia ludoviciana*	N	FACW	rhizomatous	Fair	--	--	--	--	-----	-----
ASCA3	*Asarum caudatum*	N	FAC	extensive rootstock	Poor	--	--	--	--	-----	Trampling?
ASFO	*Aster foliaceous*	N	FACU-	rhizomatous	Poor	--	--	--	--	Grazing	-----
ASMO	*Aster modestus*	N	FAC+	rhizomatous	Poor	--	--	--	--	Grazing	-----
ATFI	*Athyrium filix-femina*	Y	FAC	rhizomatous; short, stout ascending rhizomes	Fair	--	--	--	--	-----	Trampling?
CAQU	*Camassia quamash*	N	FACW	bulbous	Fair	--	--	--	--	-----	Lowering of water table?
CIAL	*Circaea alpina*	M*	FACW	rhizomatous; slender rhizomes	Poor	--	--	--	--	Ground disturbance; flooding	-----
CIAR	*Cirsium arvense*	N	FACU+	rhizomatous	Fair	M	M	L	M	Overgrazing	-----
CIVU	*Cirsium vulgare*	N	FACU	rhizomatous	Poor	--	--	--	--	Ground disturbance	Shading
CLUN	*Clintonia uniflora*	Y	FAC	rhizomatous	Poor	--	--	--	--	Shading	-----
DIHO	*Disporum hookeri*	N	FAC	rhizomatous	Poor	--	--	--	--	-----	-----
DOAL	*Dodecatheon alpinum*	N	FACW+	fibrous roots	Fair	--	--	--	--	Grazing	-----

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DOJE	*Dodecatheon jeffreyi*	N	FACW	clumps of slender rootstocks	Fair	--	--	--	--	Grazing?	-----
EPGL2	*Epilobium glandulosum*	M*	FACW-	rhizomatous; slender rhizomes	Poor	L	L	M	M	-----	Trampling?
EQAR	*Equisetum arvense*	Y	FAC	rhizomatous	Good	L	M	H	M	Flood deposition	-----
ERPE	*Erigeron perigrinus*	M*	FACW	short rhizome; short, stout caudex w/fibrous roots	Poor	--	--	--	--	Grazing?	-----
FRVE	*Fragaria vesca*	N	FACU	fibrous roots; stoloniferous	Poor	--	--	--	--	Ground disturbance	-----
FRVI	*Fragaria virginiana*	N	FACU	fibrous roots; stoloniferous	Poor	L	L	L	L	Overgrazing; ground disturbance	-----
GABO	*Galium boreale*	N	FACU	rhizomatous; well-developed, slender rhizomes	Poor	L	L	L	L	Overgrazing	-----
GATR	*Galium triflorum*	M*	FACU	rhizomatous; well-developed, slender rhizomes	Poor	L	L	L	L	Ground disturbance	-----
GEAF	*Gentiana affinis*	N	FACU	caespitose; fleshy roots	Poor	--	--	--	--	Grazing	-----
GEVI	*Geranium viscossisimum*	N	FACU+	rootstock	Poor	M	M	L	L	Overgrazing	-----
GEMA	*Geum macrophyllum*	M*	FACW+	short rootstock	Poor	M	L	L	L	Overgrazing; ground disturbance	-----
GYDR	*Gymnocarpium dryopteris*	Y	FAC	rhizomatous; elongate, slender rhizomes	Poor	--	--	--	--	Ground disturbance	-----
HADI2	*Habeneria dilitata*	M*	OBL	fleshy roots	Poor	--	--	--	--	-----	-----
HELA	*Heracleum lanatum*	M*	FAC	stout taproot or fibrous root cluster	Fair	H	M	L	L	-----	Trampling?
HYAN	*Hypericum anagalloides*	N	OBL	delicate fibrous roots; stoloniferous	Poor	--	--	--	--	-----	-----
IRMI	*Iris missouriensis*	N	FACW+	rhizomatous; thick rhizomes	Fair	--	--	--	--	Overgrazing	-----
MEAR3	*Mentha arvensis*	M*	FAC	rhizomatous; creeping rhizomes	Poor	--	--	--	--	Flood deposition	-----
MECI	*Mertensia ciliata*	M*	FACW+	branched, woody caudex	Fair	M	M	L	M	Ground disturbance	-----
MIGU	*Mimulus guttatus*	M*	OBL	fibrous roots; stoloniferous	Poor	--	--	--	--	Grazing?	-----
MILE	*Mimulus lewisii*	N	FACW+	rhizomatous; stout, branching rhizomes	Poor	--	--	--	--	-----	-----
MIMO	*Mimulus moschatus*	M*	FACW+	rhizomatous	Poor	--	--	--	--	-----	-----
MIPE	*Mitella pentandra*	M*	FACW+	rhizomatous	Poor	--	--	--	--	Ground disturbance	-----
MOCO	*Montia cordifolia*	M*	FACW+	slender to thickened rootstock	Poor	--	--	--	--	Flooding?	Trampling?
MOPE	*Montia perfoliata*	N	FAC	rhizomatous	Poor	--	--	--	--	Overgrazing	-----
OSCH	*Osmorhiza chilensis*	N	FAC	well-dev. taproot w/branching caudex	Poor	--	--	--	--	-----	-----
PAFI	*Parnassia fimbriata*	M*	OBL	short, stout rootstock	Poor	--	--	--	--	-----	Trampling
PEGR	*Pedicularis groenlandica*	N	OBL	coarse, fibrous roots; sometimes a caudex	Poor	L	L	L	L	-----	-----
PERY	*Penstemon rydbergii*	N	FACU	rhizomatous w/caudex	Poor	--	--	--	--	Overgrazing	-----
PEGA2	*Perideridia gairdneri*	N	FACU	shallow to deep, solitary to fascicled roots	Poor	--	--	--	--	Overgrazing	-----

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POOC	*Polemonium occidentalis*	N	FACW	rhizomatous; short, horizontal rhizomes	Poor	--	--	--	--	-----	-----
POBI	*Polygonum bistortoides*	N	FACW+	rhizomatous; short, bulblike rhizomes	Poor	L	L	L	L	Grazing	-----
POGR	*Potentilla gracilis*	N	FAC	heavy, branching ascending caudex	Poor	M	L	M	M	Overgrazing	-----
PRVU	*Prunella vulgaris*	N	FACU+	caudex or short rhizome	Poor	--	--	--	--	Overgrazing	-----
PYSE	*Pyrola secunda*	N	FACU	rhizomatous; slender rhizomes	Poor	--	--	--	--	Shading	-----
RAAQ	*Ranunculus aquatilis*	N	OBL	fibrous; roots at lower nodes of stems	Poor	--	--	--	--	Eutrophication of ponds?	-----
RAOC	*Ranunculus occidentalis*	N	FACW	slender, fibrous roots	Poor	--	--	--	--	Grazing	-----
RAUN2	*Ranunculus uncinatus*	M*	FAC	coarse, fibrous roots	Poor	--	--	--	--	-----	-----
RUOC	*Rudbeckia occidentalis*	N	FAC-	caudex	Poor	--	--	--	--	Overgrazing; gopher activity	-----
RUCR	*Rumex crispus*	N	FACW	taproot	Fair	--	--	--	--	Overgrazing	-----
RUOC2	*Rumex occidentalis*	N	FACW+	strong taproot	Fair	--	--	--	--	-----	-----
SASI	*Sanguisorba sitchensis*	N	**FACW**	rhizomatous	Fair	--	--	--	--	-----	-----
SAAR4	*Saxifraga arguta*	Y	FACW+	horizontal rootstocks	Fair	--	--	--	--	-----	-----
SAOR	*Saxifraga oregana*	N	FACW+	ascending caudex	Poor	--	--	--	--	-----	-----
SEFO	*Senecio foetidus*	N	FACW-	fibrous roots	Fair	--	--	--	--	Grazing	-----
SEPS	*Senecio pseudareus*	M*	FACW	fibrous roots from short rhizome or caudex	Fair	--	--	--	--	Ground disturbance	-----
SETR	*Senecio triangularis*	Y	FACW+	fibrous roots	Fair	M	M	L	L	Flood deposition	-----
SIOR	*Sidalcea oregana*	N	FACW-	taproot with branched crown	Poor	--	--	--	--	Overgrazing	-----
SMRA	*Smilacina racemosa*	N	FAC-	rhizomatous	Poor	--	--	--	--	Ground disturbance	-----
SMST	*Smilacina stellata*	M*	FAC-	rhizomatous	Poor	L	L	L	L	Ground disturbance	-----
STAM	*Streptopus amplexifolius*	M*	FAC+	rhizomatous	Fair	--	--	--	--	-----	Trampling?
TAOF	*Taraxacum officinale*	N	FACU	taproot	Poor	L	L	L	L	Overgrazing; ground disturbance	-----
THOC	*Thalictrum occidentalis*	N	FACU	rhizomatous	Poor	M	L	L	L	Grazing	-----
TITR	*Tiarella trifoliata*	M*	FAC-	rhizomatous	Poor	--	--	--	--	-----	-----
TRCA3	*Trautvettaria caroliniensis*	Y	FAC	rhizomatous	Fair	--	--	--	--	Ground disturbance	------
TRLO	*Trifolium longipes*	M*	FAC-	taproot with branched crown	Poor	--	--	--	--	-----	-----
TRRE	*Trifolium repens*	N	FACU+	fibrous roots?; stoloniferous	Poor	L	L	M	H	Seeding; overgrazing	-----
TYLA	*Typha latifolia*	Y	OBL	rhizomatous	Excellent	H	H	L	H	High nutrient inputs (N, P) into still water body	-----
URDI	*Urtica dioica*	N	FAC+	rhizomatous	Fair	H	M	L	L	Ground disturbance	-----
VAED	*Valeriana edulis*	N	FAC	long, stout taproot w/short, branched caudex	Poor	--	--	--	--	-----	-----
VERAT	*Veratrum* spp.	N	FACW+/ OBL	rhizomatous; thick rhizomes	Good	--	--	--	--	Overgrazing	-----
VEAM	*Veronica americana*	M*	OBL	rhizomatous; shallow, creeping rhizomes	Poor	--	--	--	--	-----	-----
VIGL	*Viola glabella*	M*	FACW+	fleshy rootstocks	Poor	--	--	--	--	-----	-----

APPENDIX E. SNAG ATTRIBUTES BY PLANT SERIES, ASSOCIATION OR COMM. TYPE

Snags sampled were at least 10 ft. in height and 3" in dia./breast height. All major vegetation types in which snags were found are listed below. **Snag condition** classes are as follows: **1** - recent dead; **2** - fine branches gone, bark intact; **3** - bark loose, large branch stubs; **4** - solid buckskin snag; **5** - broken and rotten (following Thomas 1979).

Vegetation Type	Snag Condition	Trees/Acre 3-9.9" dbh	Trees/Acre 10-11.9" dbh	Trees/Acre 12-14.9" dbh	Trees/Acre 15-20.9" dbh	Trees/Acre 21+" dbh
Subalpine Fir	1	3.3	5.2	3.0	0.9	---
Series	2	1.7	4.1	0.4	0.3	0.1
	3	7.1	0.6	1.0	1.8	---
	4	---	---	---	---	0.1
	5	---	---	0.3	---	0.3
Engelmann Spruce	1	1.8	---	---	0.3	0.2
Series	2	6.5	---	---	1.5	0.7
	3	1.3	---	---	---	0.7
	4	---	---	0.5	---	---
	5	---	---	---	---	0.2
Lodgepole Pine	1	4.1	---	---	---	---
Series	2	22.5	---	---	---	---
	3	15.7	---	2.1	---	---
	4	2.7	---	---	---	---
	5	7.1	---	---	---	---
Grand Fir	1	7.7	0.3	0.8	0.2	0.2
Series	2	5.8	0.8	0.8	0.5	0.4
	3	0.4	---	---	0.3	0.1
	4	---	---	---	---	---
	5	0.9	---	---	0.2	0.1
Douglas-Fir	1	5.1	---	---	0.3	0.2
Series	2	2.7	1.1	0.8	0.4	---
	3	1.4	---	---	---	---
	4	---	---	---	---	---
	5	---	---	---	0.4	---
Ponderosa Pine	1	---	---	---	---	---
Series	2	---	---	---	---	0.8
	3	---	---	---	---	---
	4	---	---	---	---	---
	5	---	---	---	---	0.4
Quaking Aspen	1	4.0	---	---	---	0.1
Series	2	13.1	1.2	2.8	2.2	---
	3	10.4	0.6	---	0.6	---
	4	8.0	---	---	0.2	---
	5	10.2	---	---	---	---
Black Cottonwood	1	---	---	---	---	0.2
Series	2	1.2	---	0.8	0.7	0.5
	3	---	---	---	0.4	---
	4	---	---	---	---	---
	5	---	---	---	---	---
Red Alder	1	---	---	---	---	---
Series	2	16.7	---	---	---	---
	3	---	---	---	---	---
	4	---	---	---	---	---
	5	---	---	---	0.4	---
Sitka Alder	1	---	---	---	---	---
Series	2	---	---	---	---	0.2
	3	1.6	---	---	---	---
	4	---	---	---	---	---
	5	---	---	---	---	---

Vegetation Type	Snag Condition	Trees/Acre 3-9.9" dbh	Trees/Acre 10-11.9" dbh	Trees/Acre 12-14.9" dbh	Trees/Acre 15-20.9" dbh	Trees/Acre 21+" dbh
Mountain Alder	1	0.5	---	---	0.2	---
Series	2	1.5	---	0.2	0.2	---
	3	---	---	0.2	---	0.1
	4	---	---	---	---	---
	5	---	---	---	0.1	---
Currants 1	4.5	---	---	0.6	---	
Series	2	---	---	0.8	0.5	---
	3	1.8	---	---	---	---
	4	---	---	---	0.5	---
	5	---	---	---	---	---
Red-osier Dogwood	1	2.0	---	---	---	---
Plant Association	2	---	---	---	---	---
	3	---	---	---	---	---
	4	---	---	---	---	---
	5	---	---	---	---	---
Black Hawthorn	1	---	---	---	1.9	0.3
Plant Community Type	2	---	---	---	---	---
	3	---	---	---	---	---
	4	---	---	---	---	---
	5	---	---	---	0.9	---
Aquatic Sedge	1	---	---	---	---	---
Plant Association	2	---	---	---	0.2	---
	3	---	---	---	---	---
	4	---	---	0.4	---	---
	5	---	---	---	---	---
Cusick's Sedge	1	---	---	---	---	---
Plant Association	2	2.0	---	---	---	---
	3	---	---	---	---	---
	4	---	---	---	---	---
	5	---	---	---	---	---
Bluejoint Reedgrass	1	---	---	---	---	---
Plant Association	2	---	2.0	1.0	---	---
	3	---	---	---	---	---
	4	---	---	---	---	---
	5	---	---	---	---	---
Densely-tufted Sedge	1	---	---	1.0	---	0.5
Plant Association	2	---	---	1.4	---	---
	3	---	---	---	---	0.4
	4	---	---	---	---	---
	5	---	---	---	---	---
Tall Mannagrass	1	---	---	---	1.0	---
Plant Association	2	---	---	---	---	---
	3	---	---	---	---	---
	4	---	---	---	---	---
	5	---	---	---	---	---
Arrowleaf Groundsel	1	---	---	4.2	3.5	3.4
Plant Community Type	2	---	---	---	---	---
	3	---	---	---	---	---
	4	---	---	---	---	---
	5	---	---	---	---	---
Brook Saxifrage	1	---	---	---	6.2	---
Plant Community Type	2	19.1	13.2	---	---	---
	3	28.6	15.4	8.5	---	---
	4	---	17.0	---	---	---
	5	---	---	---	---	---

APPENDIX F. DOWNED LOG ATTRIBUTES BY PLANT ASSOCIATION OR PLANT COMMUNITY TYPE

Authors would like to emphasize that the data presented do not necessarily represent the historic range of variability of downed log amounts and distribution. In some cases the number of plots sampled is small and probably inadequate for a reasonable depiction of downed log attributes of particular plant associations and community types. In addition, the Blue Mountains province is probably at a peak in the cycle of dead wood accumulation in the grand fir and subalpine fir vegetation zones and associated riparian vegetation types (e.g. mountain and Sitka alder types due to the last 100 years or so of fire suppression.

* - no. plots refers to the number of plots per vegetation type for which downed log data were collected. This number doesn't necessarily correspond to the number of plots used to classify the type.

** - condition classes refer to the amount of decay the logs have undergone as follows (following Thomas 1979):

1 - bark intact, twigs present, texture intact, shape round, color original, log elevated and retains original shape
2 - bark intact, twigs absent, partly soft, shape round, color original, slightly sagging
3 - bark trace, a few large hard pieces, shape round, color faded, sagging
4 - bark absent, soft blocky pieces, round to oval, light brown to yellowish, all of log on the ground
5 - soft to powdery, oval to flattened, light yellow to gray, all log on ground

- length/acre refers to the sum of the lengths of logs per acre (e.g. one acre with 3 logs with lengths of 17, 23 and 40 ft. would have a sum of 80 ft./acre).

large - refers to all logs that are $\geq$ 12 in. diameter at mid-length and $\geq$ 6 ft. in length.

small - refers to all logs that are either < 12 in. diameter and any length or $\geq$ 12 in. diameter and 6 ft. in length.

— - indicates that no logs in this category of vegetation type, condition class and size class occurred in plots sampled.

*** - in these series/associations the size classes are as follows: **large** - logs are $\geq$ 8 in. diameter and $\geq$ 6 ft. in length; small - logs are either < 8 in. diameter and any length or $\geq$ 8 in. diameter and < 6 ft. in length.

Series - data were tallied for all plots (i.e. those belonging toboth major and miscellaneous plant associations, community types and communities in that series.

SERIES	ASSOCIATION/ COMMUNITY TYPE	NO. PLOTS*	COND CLASS**	AVE (MIN-MAX) PCS/ACRE		AVE (MIN-MAX) DIAM (in.)/PC		AVE (MIN-MAX) LENGTH (ft.)/PC		AVE (MIN-MAX) LENGTH (ft.)/ACRE#	
				large	small	large	small	large	small	large	small
Herbaceous Types - Meadows											
	Holm's Sedge	11	1	---	---	---	---	---	---	---	---
	Plant Association		2	---	15 (0-168)	---	7 (7-7)	---	65 (65-65)	---	990 (0-10890)
			3	---	46 (0-335)	---	5 (3-6)	---	14 (3-30)	---	647 (0-6702)
			4	---	46 (0-335)	---	6 (3-10)	---	4 (1-10)	---	198 (0-2010)
			5	---	---	---	---	---	---	---	---
	Woodrush Sedge	5	1	---	---	---	---	---	---	---	---
	Plant Association		2	---	---	---	---	---	---	---	---
			3	---	---	---	---	---	---	---	---
			4	---	67 (0-168)	---	7 (5-10)	---	41 (2-80)	---	2748 (0-13403)
			5	34 (0-168)	134 (0-503)	12 (12-12)	7 (4-9)	10 (10-10)	21 (3-55)	335 (0-1675)	2781 (0-9215)
	Aquatic Sedge	21	1	---	16 (0-168)	---	4 (3-4)	---	13 (10-15)	---	199 (0-2513)
	Plant Association		2	---	8 (0-168)	---	5 (5-5)	---	20 (20-20)	---	160 (0-3351)
			3	16 (0-335)	144 (0-1675)	20 (20-20)	6 (4-11)	75 (50-100)	36 (2-65)	1197 (0-25126)	5174 (0-74555)
			4	16 (0-168)	88 (0-503)	12 (12-12)	6 (3-10)	38 (25-50)	19 (3-65)	598 (0-8375)	1659 (0-16586)
			5	8 (0-168)	24 (0-168)	20 (20-20)	7 (3-11)	20 (20-20)	13 (8-19)	160 (0-3350)	303 (0-3183)
	Bladder Sedge	32	1	---	16 (0-168)	---	6 (5-7)	---	48 (23-70)	---	749 (0-11728)
	Plant Association		2	5 (0-168)	5 (0-168)	18 (18-18)	10 (10-10)	80 (80-80)	50 (50-50)	419 (0-13400)	262 (0-8377)
			3	16 (0-335)	84 (0-1675)	15 (12-20)	6 (3-15)	87 (70-100)	39 (4-90)	1361 (0-31826)	3262 (0-77905)
			4	5 (0-168)	58 (0-1005)	14 (14-14)	6 (3-11)	42 (42-42)	25 (6-58)	220 (0-7035)	1466 (0-21110)
			5	---	5 (0-168)	---	4 (4-4)	---	4 (4-4)	---	21 (0-670)

SERIES	ASSOCIATION/ COMMUNITY TYPE	NO. PLOTS*	COND CLASS**	AVE (MIN-MAX) PCS/ACRE		AVE (MIN-MAX) DIAM (in.)/PC		AVE (MIN-MAX) LENGTH (ft.)/PC		AVE (MIN-MAX) LENGTH (ft.)/ACRE#	
				large	small	large	small	large	small	large	small
	Cusick's Sedge Plant Association	11	1	---	---	---	---	---	---	---	---
			2	---	107 (0-1173)	---	6 (3-8)	---	55 (40-65)	---	5864 (0-64502)
			3	---	122 (0-1173)	---	6 (4-8)	---	66 (30-80)	---	8072 (0-79581)
			4	---	---	---	---	---	---	---	---
			5	---	30 (0-168)	---	5 (4-5)	---	10 (7-12)	---	289 (0-2010)
	Inflated Sedge Plant Association	4	1	---	---	---	---	---	---	---	---
			2	---	---	---	---	---	---	---	---
			3	---	251 (0-838)	---	4 (3-6)	---	13 (8-20)	---	3309 (0-11393)
			4	---	---	---	---	---	---	---	---
			5	---	---	---	---	---	---	---	---
	Woolly Sedge Plant Association	8	1	---	---	---	---	---	---	---	---
			2	---	---	---	---	---	---	---	---
			3	---	42 (0-335)	---	3 (3-4)	---	10 (4-15)	---	398 (0-3183)
			4	21 (0-168)	42 (0-168)	13 (13-13)	8 (4-11)	10 (10-10)	2 (2-2)	209 (0-1675)	84 (0-335)
			5	21 (0-168)	42 (0-335)	14 (14-14)	7 (6-8)	7 (7-7)	5 (3-6)	147 (0-1173)	188 (0-1508)
	Bluejoint Reedgrass Plant Association	9	1	---	37 (0-335)	---	6 (3-8)	---	23 (5-40)	---	838 (0-7539)
			2	---	---	---	---	---	---	---	---
			3	---	---	---	---	---	---	---	---
			4	---	93 (0-335)	---	7 (3-10)	---	21 (1-60)	---	1973 (0-10052)
			5	93 (0-503)	---	19 (12-30)	---	52 (25-88)	---	4859 (0-31156)	---
	Densely-tufted Sedge Plant Association	5	1	---	---	---	---	---	---	---	---
			2	34 (0-168)	---	15 (15-15)	---	60 (60-60)	---	2010 (0-10050)	---
			3	---	436 (0-1173)	---	5 (3-7)	---	14 (3-50)	---	5897 (0-20942)
			4	34 (0-168)	201 (0-670)	18 (18-18)	5 (4-7)	60 (60-60)	5 (2-11)	2010 (0-10050)	905 (0-2513)
			5	---	---	---	---	---	---	---	---
	Nebraska Sedge Plant Community Type	9	1	---	---	---	---	---	---	---	---
			2	---	---	---	---	---	---	---	---
			3	19 (0-168)	19 (0-168)	18 (18-18)	3 (3-3)	70 (70-70)	3 (3-3)	1303 (0-11725)	56 (0-503)
			4	---	37 (0-335)	---	9 (7-10)	---	10 (4-15)	---	354 (0-3183)
			5	---	---	---	---	---	---	---	---
	Tufted Hairgrass Plant Association	12	1	---	---	---	---	---	---	---	---
			2	---	---	---	---	---	---	---	---
			3	---	28 (0-168)	---	6 (4-8)	---	33 (6-60)	---	921 (0-10052)
			4	---	14 (0-168)	---	6 (6-6)	---	30 (30-30)	---	419 (0-5026)
			5	---	---	---	---	---	---	---	---
	Creeping Spikerush Plant Association	8	1	---	---	---	---	---	---	---	---
			2	---	---	---	---	---	---	---	---
			3	21 (0-168)	63 (0-503)	13 (13-13)	8 (7-10)	60 (60-60)	43 (35-50)	1257 (0-10050)	2723 (0-21780)
			4	---	---	---	---	---	---	---	---
			5	---	21 (0-168)	---	5 (5-5)	---	25 (25-25)	---	524 (0-4188)

SERIES	ASSOCIATION/ COMMUNITY TYPE	NO. PLOTS*	COND CLASS**	AVE (MIN-MAX) PCS/ACRE large	AVE (MIN-MAX) PCS/ACRE small	AVE (MIN-MAX) DIAM (in.)/PC large	AVE (MIN-MAX) DIAM (in.)/PC small	AVE (MIN-MAX) LENGTH (ft.)/PC large	AVE (MIN-MAX) LENGTH (ft.)/PC small	AVE (MIN-MAX) LENGTH (ft.)/ACRE# large	AVE (MIN-MAX) LENGTH (ft.)/ACRE# small
	Baltic Rush Plant Association	9	1	---	---	---	---	---	---	---	---
			2	---	---	---	---	---	---	---	---
			3	---	---	---	---	---	---	---	---
			4	---	---	---	---	---	---	---	---
			5	---	---	---	---	---	---	---	---
	Kentucky Bluegrass Plant Community Type	2	1	---	---	---	---	---	---	---	---
			2	---	---	---	---	---	---	---	---
			3	---	168 (0-335)	---	5 (4-6)	---	11 (6-15)	---	1759 (0-3518)
			4	---	---	---	---	---	---	---	---
			5	---	---	---	---	---	---	---	---
Herbaceous Types - Springs and Streams											
	Big-leaved Sedge Plant Association	10	1	---	---	---	---	---	---	---	---
			2	---	34 (0-168)	---	3 (3-4)	---	48 (20-75)	---	1592 (0-12565)
			3	34 (0-168)	117 (0-1005)	17 (12-21)	5 (3-10)	53 (35-70)	51 (17-75)	1759 (0-11725)	5981 (0-55623)
			4	17 (0-168)	34 (0-168)	18 (18-18)	5 (3-6)	15 (15-15)	12 (10-14)	251 (0-2513)	402 (0-2346)
			5	17 (0-168)	67 (0-335)	12 (12-12)	8 (5-11)	11 (11-11)	22 (8-35)	184 (0-1843)	1458 (0-5864)
	Small-fruit Bulrush Plant Association	12	1	---	---	---	---	---	---	---	---
			2	---	14 (0-168)	---	4 (4-4)	---	50 (50-50)	---	698 (0-8377)
			3	14 (0-168)	70 (0-670)	13 (13-13)	6 (3-8)	50 (50-50)	27 (15-35)	698 (0-8375)	1885 (0-17592)
			4	14 (0-168)	70 (0-670)	17 (17-17)	7 (4-10)	30 (30-30)	14 (2-50)	419 (0-5025)	942 (0-8377)
			5	---	---	---	---	---	---	---	---
	Tall Mannagrass Plant Association	10	1	---	34 (0-335)	---	7 (4-10)	---	11 (4-18)	---	369 (0-3686)
			2	17 (0-168)	---	21 (21-21)	---	36 (36-36)	---	603 (0-6030)	---
			3	---	50 (0-335)	---	3 (3-4)	---	8 (3-12)	---	385 (0-2010)
			4	---	84 (0-503)	---	5 (3-9)	---	19 (2-60)	---	1608 (0-11393)
			5	---	17 (0-168)	---	8 (8-8)	---	4 (4-4)	---	67 (0-670)
	Common Horsetail Plant Association	5	1	---	---	---	---	---	---	---	---
			2	---	---	---	---	---	---	---	---
			3	---	34 (0-168)	---	3 (3-3)	---	2 (2-2)	---	67 (0-335)
			4	---	---	---	---	---	---	---	---
			5	---	---	---	---	---	---	---	---
	Undergreen Willow/ Holm's Sedge Plant Association	3	1	---	---	---	---	---	---	---	---
			2	---	---	---	---	---	---	---	---
			3	---	---	---	---	---	---	---	---
			4	---	---	---	---	---	---	---	---
			5	---	---	---	---	---	---	---	---
	Coyote Willow Plant Association	9	1	---	---	---	---	---	---	---	---
			2	---	37 (0-168)	---	4 (3-4)	---	6 (5-7)	---	223 (0-1173)
			3	37 (0-168)	112 (0-670)	20 (14-26)	6 (3-11)	16 (12-20)	7 (3-13)	596 (0-3350)	810 (0-5780)
			4	---	93 (0-503)	---	5 (5-7)	---	6 (2-18)	---	577 (0-3016)
			5	---	19 (0-168)	---	12 (12-12)	---	2 (2-2)	---	28 (0-251)

SERIES ASSOCIATION/ COMMUNITY TYPE	NO. PLOTS*	COND CLASS**	AVE (MIN-MAX) PCS/ACRE		AVE (MIN-MAX) DIAM (in.)/PC		AVE (MIN-MAX) LENGTH (ft.)/PC		AVE (MIN-MAX) LENGTH (ft.)/ACRE#	
			large	small	large	small	large	small	large	small
Willow Series(includes only the Willow/------ types)	37	1	---	---	---	---	---	---	---	---
		2	---	---	---	---	---	---	---	---
		3	---	23 (0-503)	---	5 (3-8)	---	67 (40-90)	---	1517 (0-31832)
		4	---	54 (0-670)	---	6 (3-10)	---	21 (3-65)	---	1121 (0-18597)
		5	---	14 (0-335)	---	6 (5-7)	---	28 (25-30)	---	385 (0-9215)
Willow/Aquatic Sedge Plant Association	9	1	---	---	---	---	---	---	---	---
		2	---	---	---	---	---	---	---	---
		3	---	---	---	---	---	---	---	---
		4	---	56 (0-335)	---	9 (7-10)	---	9 (3-12)	---	493 (0-4021)
		5	---	37 (0-335)	---	6 (5-7)	---	28 (25-30)	---	1024 (0-9215)
Willow/Woolly Sedge Plant Association	8	1	---	---	---	---	---	---	---	---
		2	---	---	---	---	---	---	---	---
		3	---	105 (0-503)	---	5 (3-8)	---	67 (40-90)	---	7016 (0-31832)
		4	---	126 (0-503)	---	5 (3-8)	---	28 (3-65)	---	3466 (0-18094)
		5	---	21 (0-168)	---	7 (7-7)	---	30 (30-30)	---	628 (0-5026)
Willow/Bladder Sedge Plant Association	12	1	---	---	---	---	---	---	---	---
		2	---	---	---	---	---	---	---	---
		3	---	---	---	---	---	---	---	---
		4	---	14 (0-168)	---	4 (4-4)	---	6 (6-6)	---	77 (0-921)
		5	---	---	---	---	---	---	---	---
Willow/Kentucky Bluegrass Plant Association	3	1	---	---	---	---	---	---	---	---
		2	---	---	---	---	---	---	---	---
		3	---	---	---	---	---	---	---	---
		4	---	---	---	---	---	---	---	---
		5	---	---	---	---	---	---	---	---
Sitka Alder Series	23	1	15 (0-168)	22 (0-335)	16 (15-16)	5 (4-6)	58 (15-100)	20 (5-30)	838 (0-16754)	437 (0-9215)
		2	7 (0-168)	58 (0-670)	20 (20-20)	7 (3-11)	80 (80-80)	41 (12-90)	583 (0-13403)	2382 (0-42722)
		3	80 (0-503)	160 (0-1675)	20 (12-30)	6 (3-11)	43 (10-100)	25 (4-80)	3460 (0-16754)	4065 (0-47413)
		4	44 (0-503)	73 (0-838)	17 (12-26)	7 (3-16)	33 (15-75)	14 (4-40)	1420 (0-12565)	1016 (0-13319)
		5	29 (0-335)	15 (0-168)	19 (17-20)	5 (4-6)	26 (10-50)	10 (7-13)	750 (0-13403)	146 (0-2178)
Sitka Alder/Ladyfern Plant Association	13	1	13 (0-168)	---	15 (15-15)	---	100 (100-100)	---	1289 (0-16750)	---
		2	---	39 (0-503)	---	4 (3-4)	---	19 (12-30)	---	735 (0-9550)
		3	77 (0-503)	103 (0-838)	22 (12-30)	5 (3-10)	43 (20-100)	20 (7-75)	3351 (0-16750)	2010 (0-13738)
		4	39 (0-168)	64 (0-503)	19 (12-26)	6 (3-10)	40 (20-75)	12 (5-25)	1547 (0-12563)	773 (0-5026)
		5	39 (0-335)	26 (0-168)	20 (20-20)	5 (4-6)	30 (10-50)	10 (7-13)	1160 (0-13400)	258 (0-2178)
Sitka Alder/Drooping Woodreed Plant Association	6	1	28 (0-168)	84 (0-335)	16 (16-16)	5 (4-6)	15 (15-15)	20 (5-30)	419 (0-2513)	1675 (0-9215)
		2	28 (0-168)	140 (0-670)	20 (20-20)	8 (4-11)	80 (80-80)	54 (15-90)	2234 (0-13400)	7539 (0-42722)
		3	112 (0-335)	363 (0-1675)	17 (12-25)	6 (3-11)	46 (10-80)	29 (4-80)	5166 (0-13400)	10527 (0-47413)
		4	---	140 (0-838)	---	9 (6-16)	---	16 (4-40)	---	2220 (0-13319)
		5	28 (0-168)	---	17 (17-17)	---	13 (13-13)	---	363 (0-2178)	---

SERIES	ASSOCIATION/ COMMUNITY TYPE	NO. PLOTS*	COND CLASS**	AVE (MIN-MAX) PCS/ACRE large	small	AVE (MIN-MAX) DIAM (in.)/PC large	small	AVE (MIN-MAX) LENGTH (ft.)/PC large	small	AVE (MIN-MAX) LENGTH (ft.)/ACRE# large	small
Mountain Alder Series		108	1	8 (0-335)	23 (0-335)	16 (12-20)	7 (3-26)	74 (60-110)	27 (4-80)	574 (0-22618)	628 (0-13403)
			2	8 (0-335)	40 (0-503)	17 (12-30)	6 (3-14)	72 (40-110)	22 (1-80)	558 (0-22618)	874 (0-17591)
			3	29 (0-503)	118 (0-1340)	17 (12-35)	6 (3-24)	40 (7-84)	19 (1-80)	1193 (0-18094)	2259 (0-30157)
			4	45 (0-503)	95 (0-1173)	17 (12-35)	6 (3-14)	38 (7-90)	12 (2-60)	1730 (0-15749)	1116 (0-14743)
			5	25 (0-503)	50 (0-670)	18 (12-24)	6 (3-20)	31 (6-90)	11 (2-40)	776 (0-22115)	544 (0-7037)
	Mountain Alder-Red-osier Dogwood Plant Association	17	1	20 (0-335)	79 (0-335)	17 (14-20)	8 (3-26)	63 (60-65)	16 (4-50)	1232 (0-20938)	1242 (0-10890)
			2	10 (0-168)	39 (0-335)	14 (14-14)	6 (4-7)	40 (40-40)	36 (5-65)	394 (0-6700)	1429 (0-17592)
			3	20 (0-335)	89 (0-670)	14 (12-15)	7 (3-13)	35 (30-40)	17 (3-50)	690 (0-11725)	1508 (0-19602)
			4	---	187 (0-1173)	---	5 (3-12)	---	10 (2-35)	---	1872 (0-14743)
			5	---	39 (0-335)	---	7 (5-9)	---	11 (6-12)	---	414 (0-3016)
	Mountain Alder-Currants Plant Association	14	1	24 (0-335)	12 (0-168)	14 (12-15)	7 (7-7)	68 (65-70)	25 (25-25)	1616 (0-22613)	299 (0-4188)
			2	36 (0-335)	48 (0-503)	19 (12-30)	5 (4-8)	82 (65-110)	13 (2-40)	2932 (0-22613)	628 (0-6702)
			3	36 (0-168)	251 (0-838)	13 (12-16)	7 (3-24)	45 (30-70)	18 (1-65)	1616 (0-11725)	4547 (0-30157)
			4	48 (0-168)	96 (0-503)	12 (12-12)	6 (3-10)	44 (10-90)	14 (4-30)	2094 (0-15075)	1292 (0-8209)
			5	36 (0-335)	24 (0-168)	16 (15-17)	7 (5-8)	26 (6-50)	7 (4-10)	945 (0-12228)	168 (0-1675)
	Mountain Alder-Common Snowberry Plant Association	9	1	---	---	---	---	---	---	---	---
			2	---	19 (0-168)	---	6 (6-6)	---	20 (20-20)	---	372 (0-3351)
			3	37 (0-168)	37 (0-335)	14 (12-15)	5 (5-6)	16 (10-22)	23 (15-30)	596 (0-3685)	838 (0-7539)
			4	56 (0-503)	56 (0-503)	28 (28-28)	5 (3-7)	22 (12-40)	10 (8-12)	1247 (0-11223)	558 (0-5026)
			5	---	---	---	---	---	---	---	---
	Mountain Alder/Ladyfern Plant Association	10	1	---	17 (0-168)	---	3 (3-3)	---	20 (20-20)	---	335 (0-3351)
			2	---	151 (0-503)	---	5 (3-14)	---	22 (1-80)	---	3267 (0-13403)
			3	50 (0-503)	134 (0-670)	21 (15-28)	4 (3-9)	36 (30-42)	23 (3-40)	1809 (0-18090)	3016 (0-15916)
			4	84 (0-335)	34 (0-168)	16 (12-28)	7 (5-8)	40 (12-75)	33 (20-45)	3384 (0-13400)	1089 (0-7539)
			5	34 (0-168)	101 (0-670)	19 (14-24)	4 (3-6)	33 (15-50)	12 (2-25)	1089 (0-8375)	1156 (0-5696)
	Mountain Alder/Big-leaved Sedge Plant Association	7	1	---	---	---	---	---	---	---	---
			2	---	---	---	---	---	---	---	---
			3	24 (0-168)	96 (0-335)	13 (13-13)	7 (5-10)	7 (7-7)	25 (4-50)	168 (0-1173)	2369 (0-8377)
			4	96 (0-335)	---	13 (12-14)	---	39 (30-65)	---	3710 (0-10888)	---
			5	24 (0-168)	---	19 (19-19)	---	35 (35-35)	---	838 (0-5863)	---
	Mountain Alder/ Dewey's Sedge Plant Association	4	1	---	---	---	---	---	---	---	---
			2	---	---	---	---	---	---	---	---
			3	---	---	---	---	---	---	---	---
			4	42 (0-168)	42 (0-168)	35 (35-35)	6 (6-6)	70 (70-70)	5 (5-5)	2932 (0-11725)	209 (0-838)
			5	84 (0-168)	42 (0-168)	16 (12-20)	5 (5-5)	36 (12-60)	5 (5-5)	3016 (0-10050)	209 (0-838)
	Mountain Alder/ Bladder Sedge Plant Association	6	1	---	---	---	---	---	---	---	---
			2	---	28 (0-168)	---	5 (5-5)	---	25 (25-25)	---	698 (0-4188)
			3	56 (0-168)	307 (0-1173)	15 (14-17)	5 (3-10)	56 (50-62)	16 (5-30)	3127 (0-10385)	5026 (0-20272)
			4	28 (0-168)	56 (0-168)	15 (15-15)	7 (3-11)	75 (75-75)	6 (4-7)	2094 (0-12563)	307 (0-1173)
			5	---	112 (0-335)	---	7 (4-10)	---	13 (4-30)	---	1480 (0-5026)

SERIES	ASSOCIATION/ COMMUNITY TYPE	NO. PLOTS*	COND CLASS**	AVE (MIN-MAX) PCS/ACRE		AVE (MIN-MAX) DIAM (in.)/PC		AVE (MIN-MAX) LENGTH (ft.)/PC		AVE (MIN-MAX) LENGTH (ft.)/ACRE#	
				large	small	large	small	large	small	large	small
	Mountain Alder/	4	1	---	---	---	---	---	---	---	---
	Common Horsetail		2	---	---	---	---	---	---	---	---
	Plant Association		3	---	168 (0-670)	---	5 (3-8)	---	44 (12-80)	---	7414 (0-29654)
			4	---	126 (0-335)	---	4 (3-4)	---	8 (5-10)	---	1005 (0-3183)
			5	42 (0-168)	42 (0-168)	14 (14-14)	3 (3-3)	15 (15-15)	6 (6-6)	628 (0-2513)	251 (0-1005)
	Mountain Alder/Tall	13	1	13 (0-168)	26 (0-168)	20 (20-20)	10 (10-11)	110 (110-110)	75 (70-80)	1418 (0-18425)	1933 (0-13403)
	Mannagrass Plant Association		2	13 (0-168)	---	13 (13-13)	---	75 (75-75)	---	967 (0-12563)	---
			3	13 (0-168)	142 (0-1173)	13 (13-13)	4 (3-9)	22 (22-22)	14 (6-23)	284 (0-3685)	1920 (0-15078)
			4	77 (0-503)	142 (0-670)	15 (13-21)	8 (4-14)	25 (7-70)	17 (4-60)	1959 (0-15745)	2358 (0-13906)
			5	26 (0-168)	77 (0-335)	18 (13-23)	10 (5-20)	32 (23-40)	15 (2-40)	812 (0-6700)	1121 (0-7037)
	Mountain Alder/Kentucky	8	1	---	21 (0-168)	---	8 (8-8)	---	60 (60-60)	---	1257 (0-10052)
	Kentucky Bluegrass		2	---	84 (0-503)	---	7 (3-12)	---	21 (3-60)	---	1759 (0-13571)
	Plant Community Type		3	21 (0-168)	21 (0-168)	17 (17-17)	8 (8-8)	50 (50-50)	4 (4-4)	1047 (0-8375)	84 (0-670)
			4	42 (0-168)	---	20 (15-24)	---	48 (20-75)	---	1990 (0-12563)	---
			5	---	42 (0-168)	---	9 (7-10)	---	14 (10-18)	---	586 (0-3016)
	Silver Sagebrush/Tufted	3	1	---	---	---	---	---	---	---	---
	Hairgrass Plant Association		2	---	---	---	---	---	---	---	---
	and Silver Sagebrush/		3	---	---	---	---	---	---	---	---
	Kentucky Bluegrass Plant		4	---	---	---	---	---	---	---	---
	Community Type		5	---	---	---	---	---	---	---	---
	Mountain Big Sagebrush/	5	1	---	---	---	---	---	---	---	---
	Cusick's Bluegrass Plant		2	---	---	---	---	---	---	---	---
	Association		3	---	---	---	---	---	---	---	---
			4	---	---	---	---	---	---	---	---
			5	---	---	---	---	---	---	---	---
	Red-osier Dogwood Plant	9	1	---	---	---	---	---	---	---	---
	Association		2	---	---	---	---	---	---	---	---
			3	19 (0-168)	112 (0-335)	26 (26-26)	6 (3-9)	35 (35-35)	16 (4-35)	652 (0-5863)	1768 (0-5864)
			4	37 (0-168)	37 (0-168)	20 (16-24)	7 (5-8)	38 (30-45)	20 (5-35)	1396 (0-7538)	745 (0-5864)
			5	56 (0-503)	37 (0-335)	14 (12-16)	11 (10-12)	40 (10-65)	5 (5-5)	2234 (0-20101)	186 (0-1675)
	Black Hawthorn Plant	9	1	---	19 (0-168)	---	6 (6-6)	---	30 (30-30)	---	558 (0-5026)
	Association		2	19 (0-168)	37 (0-168)	12 (12-12)	9 (6-12)	10 (10-10)	15 (5-25)	186 (0-1675)	558 (0-4188)
			3	37 (0-335)	130 (0-838)	18 (15-20)	5 (3-8)	50 (40-60)	15 (7-25)	1862 (0-16750)	1973 (0-11560)
			4	19 (0-168)	19 (0-168)	18 (18-18)	5 (5-5)	18 (18-18)	6 (6-6)	335 (0-3015)	112 (0-1005)
			5	---	19 (0-168)	---	5 (5-5)	---	10 (10-10)	---	186 (0-1675)
	Shrubby Cinquefoil/Tufted	6	1	---	---	---	---	---	---	---	---
	Hairgrass Plant Association		2	---	---	---	---	---	---	---	---
	and Shrubby Cinquefoil/		3	---	84 (0-503)	---	6 (4-10)	---	5 (4-6)	---	377 (0-2262)
	Kentucky Bluegrass Plant		4	---	56 (0-335)	---	8 (6-10)	---	27 (4-50)	---	1508 (0-9047)
	Community Type		5	---	---	---	---	---	---	---	---

SERIES	ASSOCIATION/ COMMUNITY TYPE	NO. PLOTS*	COND CLASS**	AVE (MIN-MAX) PCS/ACRE large	AVE (MIN-MAX) PCS/ACRE small	AVE (MIN-MAX) DIAM (in.)/PC large	AVE (MIN-MAX) DIAM (in.)/PC small	AVE (MIN-MAX) LENGTH (ft.)/PC large	AVE (MIN-MAX) LENGTH (ft.)/PC small	AVE (MIN-MAX) LENGTH (ft.)/ACRE# large	AVE (MIN-MAX) LENGTH (ft.)/ACRE# small
	Currants/	5	1	---	---	---	---	---	---	---	---
	Drooping Woodreed		2	67 (0-335)	---	18 (18-18)	---	10 (10-10)	---	670 (0-3350)	---
	Plant Association		3	168 (0-670)	402 (0-1508)	17 (12-24)	8 (3-13)	26 (7-80)	13 (3-55)	4356 (0-13400)	5060 (0-14408)
			4	235 (0-670)	134 (0-335)	19 (12-34)	6 (4-8)	63 (10-110)	20 (6-35)	14743 (0-60302)	2714 (0-6702)
			5	34 (0-168)	101 (0-168)	32 (32-32)	6 (5-7)	40 (40-40)	12 (5-20)	1340 (0-6700)	1240 (0-3351)
Subalpine Fir Series		15	1	10 (0-152)	30 (0-228)	12 (12-12)	8 (4-13)	85 (80-90)	29 (5-70)	863 (0-12946)	868 (0-7996)
			2	51 (0-228)	112 (0-381)	16 (12-30)	6 (3-12)	47 (6-75)	45 (3-90)	2381 (0-10281)	5067 (0-22465)
			3	20 (0-76)	102 (0-228)	13 (12-15)	5 (3-15)	41 (10-90)	25 (2-70)	838 (0-6854)	2538 (0-6245)
			4	30 (0-152)	107 (0-838)	16 (12-25)	6 (3-11)	38 (10-70)	10 (2-30)	1142 (0-5331)	1043 (0-5750)
			5	5 (0-76)	20 (0-76)	12 (12-12)	8 (5-11)	25 (25-25)	10 (5-15)	127 (0-1904)	203 (0-1142)
	Subalpine Fir/Ladyfern	3	1	---	---	---	---	---	---	---	---
	Plant Association		2	102 (0-228)	25 (0-76)	19 (12-30)	3 (3-3)	27 (6-70)	25 (25-25)	2767 (0-5331)	635 (0-1904)
			3	51 (0-76)	102 (0-228)	14 (13-15)	8 (3-15)	33 (15-50)	10 (2-20)	1650 (0-3808)	1041 (0-1980)
			4	51 (0-76)	---	13 (12-14)	---	48 (25-70)	---	2412 (0-5331)	---
			5	25 (0-76)	51 (0-76)	12 (12-12)	6 (5-6)	25 (25-25)	13 (10-15)	635 (0-1904)	635 (0-1142)
	Subalpine Fir/Arrowleaf	5	1	30 (0-152)	46 (0-228)	12 (12-12)	9 (6-13)	85 (80-90)	35 (5-70)	2589 (0-12947)	1599 (0-7996)
	Groundsel Plant Association		2	76 (0-152)	198 (0-381)	13 (12-15)	5 (3-8)	62 (30-75)	48 (3-90)	4722 (0-10282)	9565 (0-22465)
			3	15 (0-76)	107 (0-228)	12 (12-12)	5 (3-9)	10 (10-10)	30 (5-70)	152 (0-762)	3198 (0-6092)
			4	61 (0-152)	244 (0-762)	18 (14-25)	6 (3-11)	33 (10-70)	8 (2-20)	1980 (0-5331)	1957 (0-5521)
			5	---	15 (0-76)	---	10 (10-10)	---	5 (5-5)	---	76 (0-381)
Engelmann Spruce Series		21	1	---	4 (0-76)	---	3 (3-3)	---	5 (5-5)	---	18 (0-381)
			2	18 (0-152)	36 (0-152)	16 (12-20)	5 (3-8)	76 (20-140)	34 (3-75)	1378 (0-19038)	1218 (0-5712)
			3	18 (0-152)	98 (0-381)	18 (12-30)	6 (3-10)	58 (22-90)	29 (3-90)	1059 (0-8529)	2850 (0-11271)
			4	44 (0-152)	54 (0-228)	15 (12-30)	7 (4-12)	38 (11-80)	21 (3-75)	1639 (0-6092)	1153 (0-5712)
			5	18 (0-152)	18 (0-152)	15 (12-20)	6 (4-10)	40 (20-70)	12 (4-20)	725 (0-6854)	218 (0-2285)
	Engelmann Spruce/Ladyfern	5	1	---	15 (0-76)	---	3 (3-3)	---	5 (5-5)	---	76 (0-381)
	Plant Association		2	46 (0-152)	46 (0-152)	15 (12-18)	6 (4-8)	43 (20-80)	28 (4-75)	1980 (0-6093)	1295 (0-5712)
			3	15 (0-76)	46 (0-152)	30 (30-30)	6 (4-10)	60 (60-60)	42 (25-50)	914 (0-4570)	1904 (0-5712)
			4	46 (0-152)	46 (0-76)	14 (12-15)	8 (6-10)	29 (25-35)	31 (10-70)	1325 (0-4722)	1401 (0-5331)
			5	30 (0-76)	15 (0-76)	16 (12-20)	4 (4-4)	35 (20-50)	6 (6-6)	1066 (0-3808)	91 (0-457)
	Engelmann Spruce/Arrowleaf	5	1	---	---	---	---	---	---	---	---
	Groundsel Plant Association		2	30 (0-152)	15 (0-76)	17 (14-20)	5 (5-5)	125 (110-140)	60 (60-60)	3808 (0-19040)	914 (0-4569)
			3	---	46 (0-152)	---	4 (3-6)	---	10 (8-12)	---	457 (0-1371)
			4	46 (0-152)	30 (0-76)	19 (13-30)	6 (5-7)	50 (30-80)	5 (4-6)	2285 (0-6093)	152 (0-457)
			5	---	---	---	---	---	---	---	---
Grand Fir Series		27	1	11 (0-305)	8 (0-152)	20 (12-28)	5 (3-9)	95 (20-150)	32 (10-75)	1072 (0-28938)	268 (0-5712)
			2	3 (0-76)	25 (0-228)	20 (20-20)	6 (3-9)	100 (100-100)	33 (4-75)	282 (0-7615)	838 (0-9900)
			3	28 (0-228)	85 (0-533)	19 (13-30)	7 (3-24)	49 (12-100)	27 (2-75)	1374 (0-7768)	2180 (0-15764)
			4	25 (0-228)	73 (0-609)	18 (12-30)	8 (4-18)	28 (7-45)	12 (3-40)	705 (0-4950)	872 (0-6245)
			5	28 (0-152)	31 (0-228)	18 (12-26)	8 (4-10)	23 (6-65)	16 (3-45)	654 (0-4950)	496 (0-4722)

SERIES	ASSOCIATION/ COMMUNITY TYPE	NO. PLOTS*	COND CLASS**	AVE (MIN-MAX) PCS/ACRE		AVE (MIN-MAX) DIAM (in.)/PC		AVE (MIN-MAX) LENGTH (ft.)/PC		AVE (MIN-MAX) LENGTH (ft.)/ACRE#	
				large	small	large	small	large	small	large	small
	Grand Fir/Rocky Mountain	10	1	---	---	---	---	---	---	---	---
	Maple-Floodplain		2	---	---	---	---	---	---	---	---
	Plant Association		3	23 (0-76)	76 (0-228)	18 (13-27)	8 (4-24)	50 (15-75)	26 (2-60)	1142 (0-5712)	2003 (0-8758)
			4	38 (0-228)	114 (0-609)	14 (12-21)	8 (4-18)	23 (7-35)	11 (3-30)	891 (0-4950)	1302 (0-6245)
			5	8 (0-76)	38 (0-228)	12 (12-12)	7 (4-10)	6 (6-6)	18 (3-45)	46 (0-457)	685 (0-4722)
	Grand Fir/Ladyfern	4	1	---	---	---	---	---	---	---	---
	Plant Association		2	19 (0-76)	76 (0-228)	20 (20-20)	6 (4-7)	100 (100-100)	35 (10-70)	1904 (0-7616)	2665 (0-9900)
			3	57 (0-152)	38 (0-76)	20 (15-30)	6 (4-7)	45 (25-60)	15 (15-15)	2570 (0-6474)	571 (0-1142)
			4	---	---	---	---	---	---	---	---
			5	19 (0-76)	---	20 (20-20)	---	65 (65-65)	---	1238 (0-4950)	---
	Grand Fir/Oakfern	7	1	44 (0-305)	33 (0-76)	20 (12-28)	5 (3-9)	95 (20-150)	32 (10-75)	4134 (0-28941)	1034 (0-5712)
	Plant Association		2	---	44 (0-228)	---	7 (5-9)	---	32 (4-75)	---	1382 (0-9062)
			3	44 (0-228)	44 (0-152)	19 (15-24)	5 (4-8)	51 (12-100)	18 (10-40)	2198 (0-7768)	783 (0-3046)
			4	44 (0-76)	33 (0-152)	22 (12-30)	9 (5-16)	33 (15-45)	6 (4-8)	1447 (0-3427)	185 (0-914)
			5	54 (0-152)	54 (0-152)	19 (12-26)	10 (9-10)	18 (6-45)	14 (5-20)	990 (0-3427)	762 (0-1523)
Lodgepole Pine Series***		10	1	8 (0-76)	15 (0-76)	14 (14-14)	6 (5-6)	80 (80-80)	41 (32-50)	609 (0-6092)	624 (0-3808)
			2	30 (0-152)	15 (0-76)	15 (9-26)	5 (3-7)	61 (20-110)	17 (4-30)	1866 (0-8377)	259 (0-2285)
			3	46 (0-305)	61 (0-305)	9 (8-11)	5 (3-7)	40 (17-65)	42 (7-60)	1805 (0-14088)	2566 (0-10814)
			4	15 (0-76)	91 (0-533)	9 (9-9)	4 (3-7)	33 (15-50)	14 (4-41)	495 (0-3808)	1302 (0-7996)
			5	23 (0-152)	23 (0-152)	11 (8-15)	4 (3-5)	27 (11-40)	13 (5-28)	617 (0-3122)	289 (0-2513)
Douglas-fir Series		12	1	6 (0-76)	---	19 (19-19)	---	100 (100-100)	---	635 (0-7615)	---
			2	6 (0-76)	70 (0-228)	22 (22-22)	5 (3-8)	25 (25-25)	18 (4-42)	159 (0-1904)	1282 (0-7006)
			3	19 (0-228)	70 (0-305)	13 (12-14)	5 (3-10)	43 (30-50)	16 (3-55)	825 (0-9900)	984 (0-5026)
			4	6 (0-76)	76 (0-228)	12 (12-12)	7 (3-20)	25 (25-25)	10 (4-30)	159 (0-1904)	774 (0-4493)
			5	6 (0-76)	38 (0-152)	14 (14-14)	8 (4-12)	15 (15-15)	7 (1-15)	95 (0-1142)	254 (0-1447)
	Douglas-fir/Rocky Mountain	6	1	13 (0-76)	---	19 (19-19)	---	100 (100-100)	---	1269 (0-7616)	---
	Maple-Mallow Ninebark-		2	---	63 (0-152)	---	5 (4-8)	---	14 (7-20)	---	876 (0-2665)
	Floodplain Plant Association		3	---	63 (0-152)	---	4 (4-5)	---	14 (7-30)	---	711 (0-2818)
			4	13 (0-76)	89 (0-152)	12 (12-12)	7 (3-20)	25 (25-25)	6 (5-10)	317 (0-1904)	546 (0-762)
			5	13 (0-76)	38 (0-152)	14 (14-14)	7 (5-12)	15 (15-15)	8 (4-15)	190 (0-1142)	292 (0-1447)
	Douglas-fir/Common	4	1	---	---	---	---	---	---	---	---
	Snowberry-Floodplain		2	19 (0-76)	76 (0-228)	22 (22-22)	4 (3-7)	25 (25-25)	24 (4-42)	476 (0-1904)	1828 (0-7006)
	Plant Association		3	---	76 (0-305)	---	4 (3-7)	---	17 (3-55)	---	1257 (0-5026)
			4	---	38 (0-152)	---	6 (4-8)	---	10 (6-14)	---	381 (0-1523)
			5	---	38 (0-76)	---	7 (4-10)	---	7 (1-12)	---	248 (0-914)
Ponderosa Pine Series		11	1	7 (0-76)	7 (0-76)	12 (12-12)	4 (4-4)	65 (65-65)	70 (70-70)	450 (0-4950)	485 (0-5331)
			2	7 (0-76)	14 (0-76)	14 (14-14)	7 (6-8)	25 (25-25)	24 (2-45)	173 (0-1904)	325 (0-3427)
			3	21 (0-76)	42 (0-228)	15 (12-18)	8 (5-10)	40 (25-55)	14 (2-45)	831 (0-4188)	595 (0-3427)
			4	7 (0-76)	35 (0-152)	19 (19-19)	3 (3-4)	45 (45-45)	18 (1-45)	312 (0-3427)	623 (0-4569)
			5	---	7 (0-76)	---	5 (5-5)	---	11 (11-11)	---	76 (0-838)

SERIES	ASSOCIATION/ COMMUNITY TYPE	NO. PLOTS*	COND CLASS**	AVE (MIN-MAX) PCS/ACRE		AVE (MIN-MAX) DIAM (in.)/PC		AVE (MIN-MAX) LENGTH (ft.)/PC		AVE (MIN-MAX) LENGTH (ft.)/ACRE#	
				large	small	large	small	large	small	large	small
	Ponderosa Pine/Common Snowberry-Floodplain Plant Association	9	1	8 (0-76)	8 (0-76)	12 (12-12)	4 (4-4)	65 (65-65)	70 (70-70)	550 (0-4950)	592 (0-5331)
			2	8 (0-76)	17 (0-76)	14 (14-14)	7 (6-8)	25 (25-25)	24 (2-45)	212 (0-1904)	398 (0-3427)
			3	25 (0-76)	51 (0-228)	15 (12-18)	8 (5-10)	40 (25-55)	14 (2-45)	1015 (0-4189)	728 (0-3427)
			4	8 (0-76)	25 (0-152)	19 (19-19)	3 (3-4)	45 (45-45)	28 (15-45)	381 (0-3427)	719 (0-4569)
			5	---	8 (0-76)	---	5 (5-5)	---	11 (11-11)	---	93 (0-838)
Quaking Aspen Series* **		21	1	15 (0-76)	11 (0-152)	13 (9-18)	5 (3-7)	68 (15-120)	14 (2-31)	983 (0-9138)	156 (0-2513)
			2	22 (0-152)	29 (0-381)	13 (8-17)	5 (3-6)	70 (40-90)	30 (8-75)	1523 (0-11423)	878 (0-10357)
			3	65 (0-305)	185 (0-1066)	14 (8-17)	5 (3-8)	62 (8-120)	19 (1-70)	3153 (0-21095)	3503 (0-17363)
			4	44 (0-305)	167 (0-609)	13 (8-29)	5 (3-12)	33 (18-50)	13 (1-60)	1440 (0-8910)	2107 (0-8682)
			5	25 (0-305)	22 (0-152)	14 (9-24)	13 (4-30)	17 (8-50)	7 (1-12)	432 (0-3884)	141 (0-1675)
	Quaking Aspen/Woolly Sedge Plant Association***	5	1	30 (0-76)	30 (0-152)	15 (11-18)	6 (4-7)	93 (66-120)	17 (2-31)	2833 (0-9138)	503 (0-2513)
			2	30 (0-76)	91 (0-381)	13 (12-13)	4 (3-6)	75 (75-75)	25 (8-75)	2285 (0-11423)	2239 (0-10357)
			3	168 (0-76)	305 (0-685)	12 (8-17)	4 (3-8)	58 (8-120)	19 (2-70)	9641 (0-21095)	5879 (0-10128)
			4	76 (0-76)	259 (0-533)	16 (11-18)	5 (3-12)	37 (18-50)	7 (1-25)	2863 (0-7463)	1767 (0-3655)
			5	---	15 (0-76)	---	4 (4-4)	6 (0-0)	1 (1-1)	---	15 (0-76)
	Quaking Aspen/Common Snowberry Plant Association	5	1	---	---	---	---	---	---	---	---
			2	---	---	---	---	---	---	---	---
			3	---	15 (0-76)	---	4 (4-4)	---	9 (9-9)	---	137 (0-685)
			4	15 (0-76)	213 (0-381)	13 (8-8)	4 (3-6)	32 (32-32)	12 (3-24)	487 (0-2437)	2589 (0-5940)
			5	15 (0-76)	30 (0-152)	14 (14-14)	5 (4-5)	10 (10-10)	11 (10-12)	152 (0-762)	335 (0-1675)
	Quaking Aspen/Kentucky Bluegrass Plant Community Type***	4	1	---	---	---	---	---	---	---	---
			2	---	---	---	---	---	---	---	---
			3	57 (0-76)	267 (0-914)	8 (8-9)	5 (3-7)	38 (35-40)	16 (3-50)	2189 (0-5712)	4341 (0-15992)
			4	114 (0-76)	114 (0-381)	13 (8-29)	6 (4-7)	30 (24-34)	17 (3-32)	3370 (0-6321)	1961 (0-7615)
			5	19 (0-76)	38 (0-152)	14 (14-14)	29 (27-30)	8 (8-8)	5 (5-5)	152 (0-609)	190 (0-762)
Black Cottonwood Series		25	1	---	30 (0-381)	---	4 (3-6)	---	21 (8-60)	---	640 (0-7387)
			2	3 (0-76)	24 (0-152)	15 (15-15)	5 (3-7)	80 (80-80)	22 (6-80)	244 (0-6092)	539 (0-8377)
			3	6 (0-152)	140 (0-609)	13 (12-13)	5 (3-10)	35 (30-40)	15 (4-60)	213 (0-5331)	2164 (0-6549)
			4	6 (0-76)	52 (0-381)	16 (13-20)	6 (3-12)	10 (9-10)	8 (2-25)	58 (0-762)	399 (0-3960)
			5	18 (0-152)	15 (0-152)	14 (12-22)	9 (5-11)	16 (6-50)	16 (2-37)	286 (0-3808)	241 (0-2818)
	Black Cottonwood/Rocky Mountain Maple Plant Association	6	1	---	13 (0-76)	---	5 (5-5)	---	20 (20-20)	---	254 (0-1523)
			2	---	25 (0-152)	---	3 (3-3)	---	8 (6-10)	---	203 (0-1218)
			3	---	190 (0-381)	---	4 (3-6)	---	17 (4-45)	---	3192 (0-5712)
			4	---	76 (0-228)	---	5 (3-8)	---	8 (2-18)	---	571 (0-1599)
			5	---	13 (0-76)	---	11 (11-11)	---	32 (32-32)	---	406 (0-2437)
	Black Cottonwood/Mountain Alder-Red-Osier Dogwood Plant Association	10	1	---	8 (0-76)	---	5 (5-5)	---	60 (60-60)	---	457 (0-4569)
			2	8 (0-76)	30 (0-152)	15 (15-15)	5 (4-7)	80 (80-80)	37 (12-80)	609 (0-6093)	1119 (0-8377)
			3	15 (0-152)	122 (0-305)	13 (12-13)	5 (3-10)	35 (30-40)	16 (4-40)	533 (0-5331)	1904 (0-4722)
			4	8 (0-76)	38 (0-228)	13 (13-13)	8 (4-12)	10 (10-10)	13 (4-25)	76 (0-762)	480 (0-3960)
			5	38 (0-152)	23 (0-152)	14 (12-22)	7 (5-9)	17 (6-50)	3 (2-5)	655 (0-3808)	76 (0-381)

SERIES ASSOCIATION/ COMMUNITY TYPE	NO. PLOTS*	COND CLASS**	AVE (MIN-MAX) PCS/ACRE large	AVE (MIN-MAX) PCS/ACRE small	AVE (MIN-MAX) DIAM (in.)/PC large	AVE (MIN-MAX) DIAM (in.)/PC small	AVE (MIN-MAX) LENGTH (ft.)/PC large	AVE (MIN-MAX) LENGTH (ft.)/PC small	AVE (MIN-MAX) LENGTH (ft.)/ACRE# large	AVE (MIN-MAX) LENGTH (ft.)/ACRE# small
Black Cottonwood/Pacific Willow Plant Association	4	1	---	---	---	---	---	---	---	---
		2	---	---	---	---	---	---	---	---
		3	---	190 (0-533)	---	5 (4-7)	---	16 (4-60)	---	3065 (0-6130)
		4	19 (0-76)	114 (0-381)	20 (20-20)	5 (3-10)	9 (9-9)	4 (2-7)	171 (0-685)	438 (0-1523)
		5	19 (0-76)	19 (0-76)	15 (15-15)	11 (11-11)	8 (8-8)	37 (37-37)	152 (0-609)	704 (0-2818)
Black Cottonwood/Common Snowberry Plant Association	5	1	---	122 (0-381)	---	4 (3-6)	---	16 (8-35)	---	1980 (0-7387)
		2	---	30 (0-152)	---	6 (6-6)	---	7 (6-8)	---	213 (0-1066)
		3	---	76 (0-228)	---	6 (4-9)	---	10 (4-20)	---	731 (0-1599)
		4	---	---	---	---	---	---	---	---
		5	---	---	---	---	---	---	---	---
Red Alder Series	14	1	---	---	---	---	---	---	---	---
		2	---	5 (0-76)	---	6 (6-6)	---	30 (30-30)	---	163 (0-2285)
		3	27 (0-152)	33 (0-228)	24 (17-30)	3 (3-4)	84 (60-110)	17 (4-30)	2285 (0-15992)	566 (0-4188)
		4	33 (0-305)	38 (0-152)	21 (12-36)	5 (3-7)	73 (10-201)	37 (3-151)	2372 (0-16373)	1414 (0-11499)
		5	5 (0-76)	33 (0-228)	12 (12-12)	7 (4-10)	20 (20-20)	10 (6-12)	109 (0-1523)	321 (0-2132)
Red Alder/Pacific Ninebark Plant Association	5	1	---	---	---	---	---	---	---	---
		2	---	---	---	---	---	---	---	---
		3	15 (0-76)	61 (0-152)	26 (26-26)	3 (3-4)	60 (60-60)	18 (15-25)	914 (0-4570)	1066 (0-3046)
		4	---	30 (0-76)	---	6 (4-7)	---	4 (3-4)	---	107 (0-305)
		5	---	46 (0-228)	---	5 (4-6)	---	9 (6-12)	---	426 (0-2132)

APPENDIX G. CONSTANCY AND AVERAGE CANOPY COVER OF SPECIES

CON = % of plots in which species occurred
COV = average canopy cover in plots in which species occurred

SUBALPINE FIR TYPES

	ABLA2/ ATFI 3 Plots		ABLA2/ SETR 5 Plots		ABLA2/ CAAQ 2 Plots		ABLA2/ CACA 1 Plots		ABLA2/ CADI 2 Plots		ABLA2/ VAUL/ CASC5 2 Plots	
SPECIES	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV
DOMINANT OVERSTORY TREES												
Abies lasiocarpa	67	10	40	23	50	3	.	.	.	.	.	.
Larix occidentalis	.	.	20	2	.	.	.	.	.	.	.	.
Picea engelmannii	33	20	40	9	100	14	.	.	100	23	50	1
Pinus contorta	.	.	.	.	.	.	100	5	.	.	50	1
SUBDOMINANT OVERSTORY TREES												
Larix occidentalis	.	.	20	4	.	.	.	.	.	.	.	.
Abies lasiocarpa	67	13	20	35	50	1	.	.	50	4	50	3
Picea engelmannii	33	3	40	11	100	2	.	.	100	17	100	5
Pinus contorta	.	.	20	5	50	1	.	.	.	.	100	2
UNDERSTORY TREES												
Larix occidentalis	.	.	.	.	50	1	100	2	.	.	.	.
Picea engelmannii	67	7	40	7	100	3	100	20	50	6	100	3
Abies lasiocarpa	33	5	80	5	100	3	100	7	100	6	100	6
Pinus contorta	.	.	.	.	100	1	100	11	.	.	100	1
TALL SHRUBS												
Alnus sinuata	67	15	20	2	.	.	.	.	.	.	.	.
Rosa gymnocarpa	.	.	40	4	.	.	.	.	.	.	.	.
Ribes lacustre	100	6	100	16	.	.	.	.	100	6	.	.
Ribes hudsonianum	33	3	100	21	50	1	100	18	100	26	.	.
Taxus brevifolia	.	.	20	6	.	.	.	.	50	1	.	.
Alnus incana	.	.	.	.	50	3	100	2	100	25	.	.
Vaccinium uliginosum	.	.	.	.	.	.	.	.	.	.	100	30
LOW SHRUBS												
Linnaea borealis	33	1	40	3	100	4	.	.	50	4	.	.
Vaccinium scoparium	.	.	60	2	100	2	.	.	.	.	100	4
Kalmia microphylla	.	.	.	.	.	.	.	.	.	.	50	1
Phyllodoce empetriformis	.	.	.	.	.	.	.	.	.	.	100	6
PERENNIAL FORBS												
Urtica dioica	33	1	.	.	.	.	.	.	.	.	.	.
Viola glabella	67	2	.	.	.	.	.	.	.	.	.	.
Circaea alpina	33	3	40	5	.	.	.	.	.	.	.	.
Montia cordifolia	100	5	80	11	50	3	.	.	50	Tr	.	.
Angelica arguta	67	2	60	2	.	.	.	.	50	1	.	.
Arnica cordifolia	67	2	80	2	50	1	.	.	50	2	.	.
Habenaria saccata	67	1	40	Tr	50	1	.	.	50	Tr	.	.

Thalictrum occidentale	67	2	40	16	.	.	100	1	.	.	.	.
Mertensia paniculata	67	6	40	2	.	.	100	1	.	.	.	.
Osmorhiza chilensis	100	1	100	1	50	1	.	.	100	Tr	.	.
Galium triflorum	100	3	80	1	.	.	100	1	50	1	.	.
Tiarella trifoliata unifoliata	100	1	60	17	.	.	100	1	50	1	.	.
Clintonia uniflora	33	1	40	1	.	.	.	.	50	Tr	.	.
Aconitum columbianum	67	3	80	2	50	1	100	2	50	1	.	.
Streptopus amplexifolius	100	18	60	3	.	.	.	.	50	1	50	1
Prunella vulgaris	33	1	20	1	50	1	100	2	.	.	.	.
Saxifraga arguta	100	5	100	10	50	12	100	1	50	3	50	3
Mimulus moschatus	.	.	60	1	100	5	.	.	50	1	.	.
Trautvetteria caroliniensis	100	13	.	.	.	.	.	.	50	9	50	1
Fragaria vesca	33	Tr	60	1	.	.	100	1	50	1	.	.
Geum macrophyllum	67	1	40	2	100	1	100	2	100	2	.	.
Parnassia fimbriata	.	.	40	4	50	1	100	3	.	.	.	.
Polemonium occidentale	.	.	40	3	50	4	100	3	.	.	.	.
Smilacina stellata	33	1	.	.	.	.	.	.	50	Tr	.	.
Epilobium glandulosum	67	1	40	1	.	.	100	1	100	1	.	.
Fragaria virginiana	33	Tr	20	1	50	1	100	2	50	1	.	.
Habenaria dilatata	.	.	20	1	100	1	.	.	50	1	.	.
Pyrola secunda	33	1	80	2	.	.	.	.	50	3	50	1
Mitella pentandra	100	2	40	8	50	3	.	.	100	6	100	1
Ranunculus uncinatus	.	.	20	2	50	1	100	1	100	1	.	.
Actaea rubra	.	.	20	1	.	.	.	.	100	1	.	.
Arnica chamissonis	.	.	20	6	.	.	.	.	.	.	100	1
Senecio cymbalarioides	.	.	.	.	.	.	.	.	.	.	100	3
Caltha biflora	.	.	.	.	.	.	.	.	.	.	100	1
PERENNIAL GRASSES												
Cinna latifolia	100	2	100	2	.	.	.	.	.	.	.	.
Bromus vulgaris	67	8	40	5	.	.	100	1	50	2	.	.
Festuca subulata	33	1	.	.	50	1	100	4	.	.	.	.
Glyceria elata	67	5	100	3	50	4	100	2	100	22	50	1
Calamagrostis canadensis	.	.	.	.	100	30	100	50	.	.	.	.
Phleum alpinum	.	.	.	.	.	.	100	10	.	.	.	.
Deschampsia cespitosa	.	.	.	.	.	.	100	1	.	.	100	1
Puccinellia pauciflora	.	.	.	.	.	.	.	.	50	11	50	1
SEDGES AND RUSHES												
Carex deweyana	33	2	20	1	50	1	.	.	.	.	.	.
Scirpus microcarpus	.	.	.	.	100	33	100	2	.	.	.	.
Carex disperma	67	4	40	3	50	4	100	2	100	30	50	1
Carex aquatilis	.	.	20	1	100	20	.	.	.	.	50	8
Carex laeviculmis	33	Tr	.	.	.	.	.	.	100	23	.	.
Carex scopulorum	.	.	.	.	.	.	.	.	.	.	100	65
Eleocharis pauciflora	.	.	.	.	.	.	.	.	.	.	50	5
FERNS AND HORSETAILS												
Athyrium filix-femina	100	48	20	1	.	.	.	.	.	.	.	.

ENGELMANN SPRUCE TYPES

SPECIES	PIEN/ ATFI 5 Plots CON	COV	PIEN/ SETR 5 Plots CON	COV	PIEN/ EQAR 3 Plots CON	COV	PIEN/ CADI 2 Plots CON	COV	PIEN/ COST 2 Plots CON	COV	PIEN/ BRVU 3 Plots CON	COV	PIEN/ CILA2 1 Plots CON	COV
DOMINANT OVERSTORY TREES														
Picea engelmannii	80	23	80	26	100	27	50	40	100	19	100	19	100	25
Pinus contorta	.	.	.	.	33	10	.	.	.	.	33	5	.	.
SUBDOMINANT OVERSTORY TREES														
Picea engelmannii	40	10	60	9	67	8	.	.	100	4	33	15	100	2
UNDERSTORY TREES														
Grand fir	60	1	80	3	33	1	100	2	50	3	33	3	.	.
Pinus contorta	.	.	20	3	.	.	50	4	50	1	.	.	.	.
Picea engelmannii	20	2	40	18	100	3	100	13	100	2	100	11	100	1
TALL SHRUBS														
Taxus brevifolia	40	4	.	.	.	.	.	.	.	.	.	.	.	.
Common snowberry	60	17	.	.	33	2	.	.	.	.	.	.	.	.
Rubus parviflorus	100	4	40	2	.	.	.	.	.	.	67	6	.	.
Alnus sinuata	60	30	.	.	67	3	.	.	50	8	.	.	.	.
Ribes hudsonianum	40	26	80	12	.	.	50	1	100	3	33	20	.	.
Rosa gymnocarpa	20	1	40	11	.	.	.	.	50	1	33	14	.	.
Cornus stolonifera	.	.	60	6	.	.	50	1	100	58	.	.	.	.
Alnus incana	20	5	80	35	.	.	100	48	100	18	67	14	.	.
Ribes lacustre	80	5	100	13	33	2	50	1	100	7	100	33	100	1
Vaccinium membranaceum	.	.	20	8	33	1	50	11	.	.	67	7	.	.
LOW SHRUBS														
Linnaea borealis	.	.	40	3	33	1	100	6	.	.	33	45	100	1
Vaccinium scoparium	.	.	.	.	33	1	.	.	50	1	33	50	100	1
PERENNIAL FORBS														
Disporum hookeri	40	10	.	.	.	.	.	.	.	.	.	.	.	.
Smilacina racemosa	40	4	40	1	.	.	.	.	.	.	.	.	.	.
Viola glabella	80	4	40	3	33	1	.	.	.	.	33	1	.	.
Ranunculus uncinatus	40	1	40	2	33	1	50	1	.	.	.	.	.	.
Anenome piperi	100	1	40	1	.	.	50	1	50	1	.	.	.	.
Clintonia uniflora	60	1	40	3	33	1	.	.	.	.	33	17	.	.
Mertensia paniculata	20	1	20	3	.	.	50	8	.	.	.	.	.	.
Saxifraga arguta	100	2	80	4	67	1	50	7	.	.	67	2	.	.
Adenocaulon bicolor	60	2	20	2	.	.	50	1	.	.	33	25	.	.
Osmorhiza chilensis	80	1	60	1	67	1	50	2	.	.	67	7	.	.
Prunella vulgaris	20	1	.	.	33	2	50	1	.	.	.	.	.	.
Veronica americana	.	.	80	2	.	.	100	4	.	.	.	.	.	.
Heracleum lanatum	80	4	60	3	33	1	.	.	50	1	67	1	.	.
Actaea rubra	60	4	40	1	33	1	50	3	50	1	33	2	.	.
Streptopus amplexifolius	100	6	80	3	67	1	50	1	50	1	100	1	.	.
Angelica arguta	80	2	60	3	67	5	.	.	100	1	67	1	.	.
Galium boreale	.	.	.	.	33	2	50	1	.	.	.	.	.	.
Arenaria macrophylla	.	.	.	.	33	5	50	1	.	.	.	.	.	.

Smilacina stellata	60	2	20	5	67	1	100	6	50	3	67	2	.	.
Circaea alpina	100	2	40	2	33	1	100	1	50	2	.	.	100	1
Geum macrophyllum	60	1	80	1	67	1	100	2	.	.	33	1	100	1
Mitella pentandra	80	7	80	1	100	1	.	.	50	1	67	2	100	5
Senecio pseudaureus	.	.	.	.	.	.	50	3	.	.	.	.	.	.
Galium triflorum	100	1	100	5	67	1	100	3	100	1	100	5	100	1
Tiarella trifoliata unifoliata	80	11	20	1	.	.	.	.	.	.	.	.	100	20
Parnassia fimbriata	.	.	80	2	33	1	50	6	100	1	67	1	.	.
Senecio triangularis	60	3	100	38	33	1	.	.	50	1	67	1	100	2
Aconitum columbianum	40	1	60	3	67	1	100	1	50	1	33	1	100	1
Arnica cordifolia	.	.	40	1	33	1	100	1	.	.	100	19	.	.
Thalictrum occidentale	60	1	60	3	.	.	50	1	50	1	33	13	100	1
Mimulus moschatus	.	.	.	.	.	.	100	2	50	1	.	.	.	.
Urtica dioica	60	1	40	2	.	.	.	.	.	.	33	2	100	1
Montia cordifolia	60	5	60	9	.	.	50	5	50	1	67	1	100	10
Allium validum	.	.	.	.	.	.	50	4	50	1	.	.	.	.
Fragaria virginiana	.	.	40	1	100	1	.	.	50	1	.	.	100	1
Taraxacum officinale	.	.	40	1	67	1	50	1	50	1	.	.	100	1
Aster foliaceus	.	.	.	.	.	.	50	4	.	.	33	1	.	.
Mertensia ciliata	40	2	40	1	.	.	.	.	50	2	33	3	100	1
Epilobium glandulosum	.	.	40	1	33	1	50	1	.	.	.	.	100	1
Trautvetteria caroliniensis	40	25	20	6	.	.	.	.	50	1	.	.	100	1
Aster modestus	.	.	40	4	67	2	.	.	50	10	33	1	100	1
Pyrola asarifolia	.	.	20	1	.	.	100	2	.	.	.	.	100	1
Polemonium occidentale	.	.	20	1	33	3	.	.	50	1	.	.	100	1
Cerasteum nutans	.	.	.	.	33	1	.	.	.	.	.	.	100	2
PERENNIAL GRASSES														
Phleum alpinum	.	.	.	.	33	5	.	.	.	.	.	.	.	.
Festuca rubra	.	.	.	.	33	5	.	.	.	.	.	.	.	.
Cinna latifolia	100	3	80	5	33	1	50	2	50	5	33	1	100	95
Bromus vulgaris	60	4	80	2	.	.	100	6	100	1	100	67	.	.
Glyceria elata	40	Tr	20	10	67	6	100	25	50	1	33	1	100	2
Elymus glaucus	.	.	.	.	33	1	.	.	50	30	33	1	.	.
SEDGES AND RUSHES														
Carex muricata	.	.	.	.	33	55	.	.	.	.	.	.	.	.
Carex disperma	.	.	40	5	100	8	100	33	.	.	.	.	.	.
Scirpus microcarpus	.	.	.	.	33	4	.	.	50	10	.	.	.	.
FERNS AND HORSETAILS														
Gymnocarpium dryopteris	40	33	.	.	.	.	.	.	.	.	.	.	.	.
Equisetum arvense	.	.	40	1	100	33	.	.	50	1	33	1	.	.
Athyrium filix-femina	100	43	40	1	.	.	.	.	50	2	33	1	100	1

LODGEPOLE PINE TYPES

SPECIES	PICO/ CAAQ 2 Plots CON	COV	PICO/ DECE 1 Plot CON	COV	PICO/ CALA3 1 Plot CON	COV	PICO/ALIN/ MESIC FORB 1 Plot CON	COV	PICO/ CACA 1 Plot CON	COV	PICO/ POPR 4 Plots CON	COV
DOMINANT OVERSTORY TREES												
Pinus contorta	100	7	100	50	100	10	100	20	100	30	75	26
SUBDOMINANT OVERSTORY TREES												
Pinus contorta	100	15	100	30	100	5	100	20	100	4	50	24
UNDERSTORY TREES												
Pinus contorta	100	3	100	25	100	2	.	.	100	3	50	4
TALL SHRUBS												
Lonicera involucrata	50	1	100	1	.	.	.	.	.	.	.	.
Salix geyeriana	.	.	100	3	.	.	.	.	.	.	.	.
Ribes hudsonianum	50	1	.	.	100	1	.	.	.	.	.	.
Ribes cereum	.	.	100	2	.	.	.	.	.	.	25	2
Ribes inerme	.	.	100	1	.	.	.	.	.	.	25	1
Symphicarpos albus	.	.	100	1	100	3	.	.	.	.	50	1
Ribes lacustre	50	1	.	.	.	.	100	3	.	.	25	2
Alnus incana	.	.	.	.	.	.	100	75	.	.	25	2
Betula glandulosa	.	.	.	.	.	.	.	.	100	30	.	.
Ribes irriguum	.	.	.	.	.	.	.	.	.	.	25	20
LOW SHRUBS												
Vaccinium scoparium	100	2	.	.	.	.	.	.	.	.	.	.
Linnaea borealis	.	.	.	.	.	.	.	.	100	10	.	.
PERENNIAL FORBS												
Violo nuttallii	50	3	.	.	.	.	.	.	.	.	.	.
Dodecatheon jeffreyi	50	20	.	.	.	.	.	.	.	.	.	.
Veronica americana	50	1	.	.	.	.	.	.	.	.	.	.
Thalictrum occidentalis	50	1	100	7	.	.	.	.	.	.	.	.
Arnica chamissonis	50	3	100	2	.	.	100	8	.	.	.	.
Veronica serpyllifolia	50	1	100	1	.	.	100	1	.	.	.	.
Senecio pseudareus	50	20	.	.	100	5	.	.	.	.	25	8
Mimulus guttatus	50	1	.	.	100	1	.	.	.	.	25	2
Geum macrophyllum	100	1	100	1	100	1	100	3	.	.	50	6
Galium boreale	50	7	100	1	100	1	100	1	.	.	25	1
Habenaria dilitata	100	1	.	.	.	.	.	.	100	1	.	.
Angelica arguta	.	.	.	.	100	5	.	.	.	.	.	.
Violo orbiculata	50	2	.	.	100	1	100	1	.	.	.	.
Arenaria macrophylla	.	.	100	1	.	.	100	12	.	.	.	.
Taraxacum officinale	100	1	100	1	.	.	100	1	.	.	75	5
Achillea millefolium	100	1	100	1	100	1	100	1	.	.	100	4
Trifolium longipes	50	2	.	.	100	20	100	10	.	.	25	1
Ranunculus occidentalis	.	.	100	1	.	.	100	2	.	.	25	1
Galium triflorum	.	.	100	1	.	.	100	5	.	.	25	5
Smilacina stellata	50	1	.	.	.	.	100	2	.	.	25	1
Fragaria virginiana	100	11	100	3	100	1	100	1	100	1	100	14

Ranunculus uncinatus	50	1	.	.	100	1	100	1	.	.	50	1
Epilobium angustifolium	.	.	100	1	100	1	100	1	100	1	.	.
Saxifraga oregana	.	.	.	.	100	25	.	.	.	.	25	2
Polemonium occidentalis	50	1	.	.	100	2	.	.	100	1	25	1
Hypericum anagalloides	50	7	.	.	.	.	.	.	100	1	.	.
Potentilla gracilis	.	.	100	1	.	.	100	1	.	.	75	4
Allium validum	50	1	.	.	.	.	.	.	100	3	25	5
Mertensia ciliata	.	.	.	.	.	.	100	10	.	.	.	.
Senecio triangularis	.	.	.	.	.	.	100	1	.	.	.	.
Urtica dioica	.	.	.	.	.	.	100	1	.	.	25	4
Arnica cordifolia	.	.	.	.	.	.	100	2	.	.	25	1
Prunella vulgaris	.	.	.	.	.	.	.	.	.	.	50	3
Aconitum columbianum	.	.	.	.	.	.	.	.	.	.	25	2
PERENNIAL GRASSES												
Bromus vulgaris	50	1	.	.	.	.	.	.	.	.	.	.
Phleum alpinum	50	1	.	.	.	.	.	.	.	.	.	.
Deschampsia cespitosa	100	3	100	60	.	.	.	.	100	1	.	.
Festuca occidentalis	50	2	.	.	.	.	100	1	.	.	.	.
Glyceria elata	50	1	.	.	.	.	100	5	.	.	25	10
Festuca rubra	50	1	.	.	.	.	.	.	.	.	50	2
Calamagrostis canadensis	.	.	100	5	.	.	.	.	100	80	.	.
Poa pratensis	50	1	100	30	.	.	100	15	.	.	100	61
Elymus glaucus	.	.	100	1	.	.	.	.	100	1	25	1
Cinna latifolia	.	.	.	.	.	.	100	25	.	.	.	.
Agrostis stolonifera	.	.	.	.	.	.	.	.	100	1	25	3
Bromus inermis	.	.	.	.	.	.	.	.	.	.	50	2
Phleum pratense	.	.	.	.	.	.	.	.	.	.	75	4
Trisetum canescens	.	.	.	.	.	.	.	.	.	.	25	5
SEDGES AND RUSHES												
Juncus ensifolius	50	1	.	.	.	.	.	.	.	.	.	.
Carex luzulina	50	1	.	.	.	.	.	.	.	.	.	.
Carex aurea	50	1	.	.	100	1	.	.	.	.	.	.
Juncus balticus	50	4	100	10	.	.	100	1	.	.	.	.
Carex aquatilis	100	70	100	5	.	.	.	.	100	3	.	.
Cared disperma	50	35	.	.	.	.	.	.	.	.	25	3
Carex jonesii	50	3	.	.	.	.	.	.	.	.	25	85
Carex microptera	50	1	100	1	100	1	100	2	.	.	25	2
Carex praticola	.	.	100	1	.	.	100	2	.	.	.	.
Carex praegracilis	.	.	.	.	100	3	.	.	.	.	.	.
Carex utriculata	50	1	100	1	100	1	.	.	100	3	25	12
Luzula campestris multiflora	100	3	.	.	.	.	100	1	.	.	50	1
Carex deweyana	.	.	.	.	.	.	100	4	.	.	.	.
Carex lanuginosa	.	.	.	.	100	70	.	.	100	1	.	.
Scirpus microphylla	.	.	.	.	100	4	.	.	100	1	.	.
FERNS AND HORSETAILS												
Equisetum arvense	50	5	.	.	100	2	100	1	.	.	25	1

GRAND FIR TYPES

SPECIES	ABGR/ ATFI 4 Plots		ABGR/ GYDR 8 Plots		ABGR/ACGL-FLOODPLAIN 10 Plots		ABGR/SYAL-FLOODPLAIN 4 Plots		ABGR/ CALA3 1 Plot		PIMO/ DECE 1 Plot	
	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV
DOMINANT OVERSTORY TREES												
Picea engelmannii	25	25	50	31	20	24	50	30	.	.	.	.
Abies grandis	25	15	75	27	70	29	25	12	100	16	.	.
Pinus ponderosa	.	.	.	.	.	.	25	30	.	.	.	.
Pinus contorta	.	.	.	.	.	.	.	.	100	20	.	.
Larix occidentalis	.	.	.	.	.	.	.	.	100	2	.	.
Pinus monticola	.	.	.	.	.	.	.	.	.	.	100	75
SUBDOMINANT OVERSTORY TREES												
Abies grandis	50	40	100	14	30	11	25	20	.	.	100	11
Picea engelmannii	.	.	13	10	10	4	50	12	.	.	.	.
Pseudotsuga menziesii	.	.	.	.	.	.	.	.	100	5	.	.
Pinus monticola	.	.	.	.	.	.	.	.	.	.	100	7
UNDERSTORY TREES												
Picea engelmannii	75	3	75	1	30	2	50	5	.	.	.	.
Pseudotsuga menziesii	.	.	13	1	20	1	50	1	.	.	.	.
Abies grandis	75	5	75	4	80	5	100	19	100	5	100	2
TALL SHRUBS												
Alnus sinuata	50	37	.	.	20	22	.	.	.	.	.	.
Taxus brevifolia	25	25	63	26	.	.	.	.	.	.	.	.
Ribes hudsonianum	25	3	38	8	10	5	.	.	.	.	.	.
Alnus incana	50	15	50	12	30	2	50	17	.	.	.	.
Acer glabrum	50	2	63	8	100	40	50	1	.	.	.	.
Rubus parviflorus	25	5	50	8	40	13	50	2	.	.	.	.
Amelanchior alnifolia	25	1	63	1	70	4	50	2	.	.	.	.
Symphoricarpos albus	50	1	88	18	80	34	100	37	.	.	.	.
Holodiscus discolor	.	.	13	3	40	3	.	.	.	.	.	.
Cornus stolonifera	25	8	25	2	20	6	50	9	.	.	.	.
Physocarpus malvaceus	.	.	.	.	30	11	.	.	.	.	.	.
Ribes lacustre	75	4	100	3	30	4	75	5	100	1	.	.
Rosa gymnocarpa	25	18	88	2	60	12	25	4	100	1	.	.
Spiraea betulifolia	.	.	.	.	50	4	25	1	.	.	.	.
Philadelphus lewisii	.	.	.	.	40	16	25	35	.	.	.	.
Crataegus douglasii	.	.	.	.	20	3	25	55	.	.	.	.
LOW SHRUBS												
Berberis repens	.	.	.	.	20	1	50	10	.	.	.	.
Linnaea borealis	25	20	75	7	20	44	.	.	100	15	100	1
PERENNIAL FORBS												
Senecio triangularis	50	1	.	.	.	.	.	.	.	.	.	.
Saxifraga arguta	75	3	.	.	.	.	.	.	.	.	.	.
Cardamine cordifolia	50	2	13	1	.	.	.	.	.	.	.	.
Ranunculus uncinatus	75	1	.	.	10	1	.	.	.	.	.	.
Veronica americana	25	4	13	1	.	.	.	.	.	.	.	.
Streptopus amplexifolius	100	9	88	2	10	1	.	.	.	.	.	.

Mitella pentandra	100	12	50	2	30	2	.	.	.	.	.	.
Montia cordifolia	75	8	50	1	20	3	.	.	.	.	.	.
Tiarella trifoliata unifoliata	75	19	88	9	10	5	.	.	.	.	.	.
Heracleum lanatum	25	2	25	3	20	2	.	.	.	.	.	.
Circaea alpina	100	4	50	1	40	7	25	4	.	.	.	.
Trautvetteria caroliniensis	50	3	75	17	20	1	25	1	.	.	.	.
Disporum hookeri	50	3	38	11	20	3	25	1	.	.	.	.
Actaea rubra	25	2	75	1	50	2	.	.	.	.	.	.
Adenocaulon bicolor	75	3	75	1	60	1	50	1	.	.	.	.
Clintonia uniflora	25	4	75	5	30	5	25	1	.	.	.	.
Anenome piperi	25	1	63	2	40	1	25	4	.	.	.	.
Viola glabella	50	3	63	2	50	11	50	2	.	.	.	.
Arnica cordifolia	25	1	50	1	50	8	25	17	.	.	.	.
Galium triflorum	75	1	75	5	100	4	75	3	.	.	.	.
Geum macrophyllum	75	1	38	1	30	1	.	.	100	2	.	.
Smilacina stellata	50	7	88	6	60	1	50	1	100	20	.	.
Urtica dioica	75	3	13	3	20	2	.	.	100	Tr	.	.
Thalictrum occidentale	50	2	38	2	30	2	.	.	100	1	.	.
Aconitum columbianum	50	1	25	1	40	5	.	.	100	2	.	.
Osmorhiza chilensis	50	3	38	1	80	6	75	1	100	1	.	.
Angelica arguta	.	.	.	.	30	1	25	1	.	.	.	.
Prunella vulgaris	50	1	13	2	30	4	25	3	100	5	.	.
Epilobium glandulosum	50	2	13	1	.	.	.	.	100	1	.	.
Pyrola secunda	25	1	88	1	10	1	25	1	.	.	100	6
Smilacina racemosa	25	2	13	1	10	2	25	2	100	10	.	.
Achillea millifolium	25	1	.	.	20	1	75	2	100	1	100	25
PERENNIAL GRASSES												
Cinna latifolia	100	6	38	1	20	9	.	.	.	.	.	.
Glyceria elata	25	3	13	3	30	4	.	.	.	.	.	.
Bromus vulgaris	50	2	25	3	40	3	50	3	.	.	.	.
Festuca occidentalis	.	.	13	1	60	1	75	5	100	3	.	.
Trisetum canescens	.	.	.	.	10	4	25	1	100	10	.	.
Phleum pratense	.	.	.	.	.	.	25	20	100	1	.	.
Elymus glaucus	.	.	.	.	30	2	100	4	100	2	100	10
Deschampsia cespitosa	.	.	.	.	.	.	.	.	100	2	100	13
SEDGES AND RUSHES												
Carex deweyana	.	.	25	1	20	2	25	25	.	.	.	.
Carex concinnoides	.	.	.	.	10	5	50	8	.	.	.	.
Carex microptera	.	.	13	2	.	.	25	1	100	23	.	.
Carex geyeri	.	.	13	1	40	4	25	1	100	1	100	3
Carex lanuginosa	.	.	.	.	.	.	.	.	100	75	.	.
FERNS AND HORSETAILS												
Gymnocarpium dryopteris	25	15	100	32	.	.	.	.	.	.	.	.
Athyrium filix-femina	100	53	100	2	10	2	25	5	.	.	.	.
Equisetum arvense	25	3	13	1	20	6	25	1	.	.	.	.
Cystopteris fragilis	.	.	13	1	50	1	.	.	.	.	.	.
Adiantum pedatum	.	.	.	.	.	.	.	.	.	.	100	8

DOUGLAS-FIR AND PONDEROSA PINE TYPES

SPECIES	PSME/ TRCA3 3 Plots		PSME/ACGL-PHMA-FLOODPLAIN 6 Plots		PSME/SYAL-FLOODPLAIN 4 Plots		PIPO/ SYAL 9 Plots		PIPO/ POPR 3 Plots	
	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV
DOMINANT OVERSTORY TREES										
Populus trichocarpa	.	.	17	10	.	.	.	.	.	.
Larix occidentalis	.	.	33	18	25	20	.	.	.	.
Pinus ponderosa	.	.	50	6	50	35	89	36	67	64
Juniperus occidentalis							.	.	33	9
SUBDOMINANT OVERSTORY TREES										
Pinus ponderosa	33	5	17	1	25	10	56	18	33	30
Pseudotsuga menziesii	67	12	50	8	50	4	.	.	.	.
UNDERSTORY TREES										
Abies grandis	100	1	67	1	25	2	.	.	.	.
Pseudotsuga menziesii	67	12	100	2	25	1	.	.	.	.
Juniperus occidentalis	.	.	.	.	.	.	22	7	.	.
Pinus ponderosa	.	.	.	.	.	.	22	1	33	10
TALL SHRUBS										
Ribes irriguum	67	7	17	6	.	.	.	.	.	.
Spiraea betulifolia	67	2	67	12	.	.	.	.	.	.
Physocarpus malvaceus	67	40	83	7	.	.	.	.	.	.
Amelanchior alnifolia	67	1	50	10	25	5	.	.	.	.
Ribes lacustre	67	3	50	2	25	1	11	40	33	1
Acer glabrum	33	70	100	17	.	.	.	.	.	.
Rosa gymnocarpa	100	2	67	3	75	5	22	11	.	.
Holodiscus discolor	.	.	50	22	.	.	.	.	.	.
Symphoricarpos albus	100	10	100	44	100	53	100	34	100	2
Philadelphus lewisii	.	.	67	8	25	4	.	.	.	.
Betula occidentalis	.	.	33	25	25	75	.	.	.	.
Rubus parviflorus	.	.	50	6	50	1	.	.	.	.
Cornus stolonifera	.	.	33	7	75	4	.	.	.	.
Crataegus douglasii	.	.	.	.	50	25	33	75	.	.
Prunus virginiana	.	.	.	.	.	.	33	7	.	.
Ribes aureum	.	.	.	.	.	.	11	15	.	.
Rosa woodsii	.	.	.	.	.	.	22	16	33	2
Ribes cereum	.	.	.	.	.	.	11	1	67	4
PERENNIAL FORBS										
Aconitum columbianum	67	13	.	.	.	.	22	3	.	.
Senecio pseudareus	33	7	.	.	.	.	.	.	.	.
Veronica americana	67	3	.	.	.	.	.	.	.	.
Osmorhiza occidentalis	33	20	.	.	.	.	.	.	.	.
Trautvetteria caroliniensis	100	58	.	.	.	.	.	.	.	.
Mitella pentandra	67	1	.	.	.	.	.	.	.	.
Viola canadensis	67	4	17	1	.	.	.	.	.	.
Ranunculus uncinatus	100	2	33	1	.	.	.	.	.	.
Geum macrophyllum	100	1	33	1	.	.	.	.	.	.
Heracleum lanatum	33	1	17	1	.	.	33	13	.	.

Anenome piperi	100	1	50	1	.	.	.	.	.	.
Aquilegia formosa	100	1	50	1	.	.	.	.	.	.
Arnica cordifolia	100	3	67	30	.	.	22	3	.	.
Smilacina stellata	100	4	83	4	.	.	56	12	33	1
Vicia americana	33	1	33	1	.	.	.	.	.	.
Thalictrum occidentale	100	13	50	3	25	3	33	17	33	1
Achillea millifolium	100	1	33	1	50	10	67	4	100	5
Fragaria vesca	100	1	83	2	50	1	.	.	.	.
Galium triflorum	67	3	100	5	50	1	22	3	.	.
Smilacina racemosa	33	1	67	1	25	1	33	7	.	.
Osmorhiza chilensis	67	9	67	3	75	4	22	6	.	.
Viola glabella	.	.	50	3	25	1				
Gernium viscossimum	.	.	.	.	.	.	33	5	.	.
Galium asperrimum	.	.	.	.	.	.	11	30	.	.
Trifolium repens	.	.	.	.	.	.	22	3	.	.
Silene menziesii	.	.	.	.	.	.	22	1	.	.
Fragaria virginiana	.	.	.	.	.	.	56	7	33	1
Galium boreale	.	.	.	.	.	.	56	5	67	6
Potentilla gracilis	.	.	.	.	.	.	44	7	67	2
Potentilla glandulosa	.	.	.	.	.	.	22	1	33	2
Aster foliaceous	.	.	.	.	.	.	11	1	33	10
PERENNIAL GRASSES										
Poa pratensis	67	1	33	63	50	19	78	40	100	39
Festuca occidentalis	67	5	50	3	50	5	.	.	.	.
Calamagrostis rubescens	.	.	50	4	25	1	11	10	.	.
Elymus glaucus	.	.	33	2	100	10	67	5	33	10
Bromus orcuttianus	.	.	.	.	50	26	11	35	.	.
Bromus pacificus	.	.	.	.	.	.	11	15	.	.
Dactylis glomerata	.	.	.	.	.	.	33	1	67	7
Festuca rubra	.	.	.	.	.	.	11	25	33	50
Bromus carinatus	.	.	.	.	.	.	11	1	33	8
Agropyron caninum	.	.	.	.	.	.	11	1	67	31
Agropyron inerme	.	.	.	.	.	.	.	.	33	19
Stipa occidentalis	.	.	.	.	.	.	.	.	33	15
SEDGES AND RUSHES										
Carex geyeri	67	3	83	5	50	23	33	19	.	.
Carex deweyana	.	.	.	.	50	2	.	.	.	.
FERNS AND HORSETAILS										
Equisetum fluviatile	.	.	.	.	.	.	.	.	33	5

QUAKING ASPEN TYPES

SPECIES	POTR/ CAAQ 2 Plots		POTR/ CALA3 5 Plots		POTR/ CACA 3 Plots		POTR/ ALIN-COST 1 Plots		POTR/ ALIN-SYAL 1 Plots		POTR/ SYAL 5 Plots		POTR/ POPR 4 Plots		POTR/ MFORB 2 Plots	
	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV
DOMINANT OVERSTORY TREES																
Picea engelmanii	50	30	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pinus contorta	50	5	.	.	33	1	.	.	.	.	.	.	25	5	.	.
Pinus ponderosa	.	.	20	1	.	.	.	.	.	.	20	30	.	.	.	.
Populus tremuloides	100	58	80	39	100	52	100	45	100	30	100	53	100	43	100	21
Juniperus occidentalis	.	.	.	.	.	.	.	.	.	.	20	10	.	.	.	.
SUBDOMINANT OVERSTORY TREES																
Pinus contorta	.	.	.	.	33	2	.	.	.	.	.	.	.	.	.	.
Picea engelmannii	.	.	.	.	33	4	.	.	.	.	.	.	.	.	.	.
Populus tremuloides	.	.	80	21	33	2	100	3	100	2	20	3	75	44	100	43
UNDERSTORY TREES																
Abies lasiocarpa	50	1	.	.	67	2	.	.	.	.	20	7	.	.	.	.
Picea engelmannii	.	.	.	.	100	1	.	.	.	.	20	1	.	.	.	.
Pinus contorta	.	.	.	.	67	3	.	.	.	.	.	.	25	2	.	.
Populus tremuloides	50	80	100	8	100	34	100	12	100	1	60	16	75	10	50	30
Pinus ponderosa	.	.	40	1	.	.	.	.	100	1	20	5	50	1	.	.
Abies grandis	.	.	20	1	67	3	.	.	100	3	20	2	25	1	50	1
TALL SHRUBS																
Prunus virginiana	.	.	.	.	.	.	100	20	.	.	.	.	.	.	.	.
Cornus stolonifera	.	.	.	.	.	.	100	35	.	.	.	.	.	.	.	.
Alnus incana	.	.	.	.	33	1	100	25	100	40	.	.	25	1	.	.
Ribes lacustre	.	.	20	1	.	.	100	1	100	1	.	.	25	1	50	13
Symphoricarpos albus	.	.	40	2	33	1	100	30	100	15	100	29	75	4	50	1
PERENNIAL FORBS																
Pedicularis groenlandica	50	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aconitum columbianum	50	1	20	4	33	3	.	.	.	.	.	.	.	.	.	.
Veratrum viride	50	8	.	.	67	7	.	.	.	.	.	.	.	.	.	.
Epilobium glandulosum	50	1	20	1	.	.	.	.	.	.	20	6	.	.	.	.
Trautvettaria caroliniensis	.	.	.	.	33	6	.	.	.	.	.	.	.	.	.	.
Aster modestus	50	3	20	1	.	.	.	.	.	.	20	10	25	25	.	.
Aster foliaceus	50	4	.	.	67	11	.	.	.	.	40	10	25	2	.	.
Galium triflorum	50	1	40	4	33	1	100	1	100	2	60	1	.	.	.	.
Mentha arvensis	.	.	40	18	.	.	.	.	.	.	.	.	25	15	.	.
Urtica dioica	50	1	.	.	.	.	100	3	100	1	20	3	.	.	.	.
Trifolium longipes	.	.	40	2	33	12	.	.	.	.	.	.	50	2	.	.
Aster spp.	.	.	40	5	33	1	.	.	100	25	.	.	25	4	.	.
Senecio serra	50	4	20	1	.	.	.	.	100	1	20	1	50	1	.	.
Aquilegia formosa	.	.	60	1	.	.	100	1	100	1	20	1	50	1	.	.
Galium boreale	50	1	40	1	33	1	.	.	.	.	40	10	50	1	50	2
Potentilla gracilis	50	1	40	1	.	.	.	.	.	.	20	1	50	1	50	2
Fragaria virginiana	.	.	80	6	33	4	100	1	100	2	40	4	75	2	50	1
Taraxacum offincinale	.	.	60	1	.	.	100	1	100	1	20	2	50	1	50	9
Smilacina stellata	.	.	80	20	67	3	100	5	100	1	20	1	75	1	100	15
Osmorhiza chilensis	.	.	20	1	33	1	100	1	.	.	40	1	25	2	50	1

Cynoglossum officinale	.	.	.	.	.	.	100	2	.	.	20	20	50	1	.	.
Iris missouriensis	.	.	40	13	.	.	.	.	.	.	40	29	50	4	.	.
Senecio foetidus	.	.	20	5	33	40	.	.	.	.	.	.	.	.	50	35
Geum macrophyllum	50	3	40	1	33	1	.	.	100	3	40	5	75	2	100	1
Thalictrum occidentale	.	.	60	8	.	.	.	.	100	15	60	7	75	2	50	1
Achillea millifolium	.	.	60	1	.	.	.	.	100	1	100	4	75	3	50	1
Fragaria vesca	.	.	.	.	.	.	.	.	100	1	60	2	50	14	.	.
Ranunculus uncinatus	.	.	40	1	33	7	.	.	.	.	.	.	25	1	100	2
Geranium viscossimum	.	.	.	.	.	.	.	.	.	.	40	3	.	.	.	.
Circaea alpina	.	.	.	.	.	.	.	.	100	1	.	.	25	4	50	14
Camassia quamash	.	.	20	1	.	.	.	.	.	.	20	8	.	.	50	10
Arnica chamissonis	.	.	20	12	.	.	.	.	.	.	.	.	.	.	50	20
Ranunculus occidentalis	.	.	20	2	.	.	.	.	.	.	.	.	25	60	50	8
Veratrum spp.	.	.	.	.	.	.	.	.	.	.	.	.	50	14	.	.
Ranunculus orthorhynchus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	50	7
PERENNIAL GRASSES																
Bromus inermis	.	.	40	1	.	.	.	.	.	.	.	.	.	.	.	.
Calamagrostis canadensis	100	33	.	.	100	64	.	.	.	.	20	1	.	.	.	.
Deschampsia cespitosa	50	15	20	2	67	19	.	.	.	.	.	.	25	1	.	.
Phleum pratense	100	5	40	3	33	1	.	.	.	.	40	4	25	6	.	.
Trisetum wolfii	.	.	.	.	33	5	.	.	.	.	.	.	.	.	.	.
Elymus glaucus	50	20	60	25	.	.	100	60	100	2	80	21	25	7	.	.
Glyceria elata	50	18	20	1	33	2	.	.	100	5	.	.	.	.	50	1
Poa pratensis	50	1	100	7	.	.	100	1	100	3	100	23	100	53	.	.
Bromus carinatus	.	.	.	.	.	.	100	1	.	.	20	1	25	10	.	.
Agrostis stolonifera	.	.	20	1	.	.	.	.	100	10	20	20	25	85	.	.
Festuca occidentalis	.	.	.	.	.	.	.	.	100	1	.	.	25	40	.	.
Trisetum canescens	.	.	20	5	33	10	.	.	.	.	20	5	25	4	50	2
Bromus vulgaris	.	.	.	.	.	.	.	.	.	.	20	40	.	.	.	.
Calamagrostis rubescens	.	.	.	.	.	.	.	.	.	.	20	65	.	.	.	.
Agrostis diegoensis	.	.	.	.	.	.	.	.	.	.	20	8	.	.	.	.
Hordeum brachyantherum	.	.	.	.	.	.	.	.	.	.	20	12	.	.	.	.
SEDGES AND RUSHES																
Carex aquatilis	100	28	20	3	.	.	.	.	.	.	.	.	.	.	.	.
Carex jonesii	50	5	20	1	.	.	.	.	.	.	.	.	.	.	.	.
Juncus nevadensis	50	8	20	1	33	2	.	.	.	.	.	.	.	.	.	.
Carex nebraskensis	.	.	40	2	.	.	.	.	.	.	.	.	.	.	.	.
Carex scopulorum	.	.	.	.	33	10	.	.	.	.	.	.	.	.	.	.
Carex utriculata	.	.	.	.	33	10	.	.	.	.	.	.	.	.	.	.
Carex lenticularis lenticularis	.	.	.	.	33	12	.	.	.	.	.	.	.	.	.	.
Carex lanuginosa	.	.	100	41	33	1	.	.	.	.	.	.	25	5	.	.
Carex athrostachya	.	.	.	.	33	4	.	.	.	.	20	10	.	.	.	.
Carex deweyana	50	10	.	.	.	.	.	.	100	1	40	3	.	.	.	.
Carex microptera	.	.	60	1	67	3	100	1	.	.	.	.	25	3	50	2
Carex geyeri	.	.	.	.	.	.	100	1	.	.	40	17	25	1	.	.
FERNS AND HORSETAILS																
Equisetum arvense	.	.	.	.	33	20	100	1	100	3	.	.	.	.	.	.

BLACK COTTONWOOD TYPES

SPECIES	POTR2/ SALA2 4 Plots CON	COV	POTR2/ ALIN-COST 10 Plots CON	COV	POTR2/ ACGL 6 Plots CON	COV	POTR2/ SYAL 5 Plots CON	COV
DOMINANT OVERSTORY TREES								
Populus trichocarpa	25	60	100	37	100	25	100	56
Abies grandis	.	.	20	4	17	10	20	13
Pseudotsuga menziesii	.	.	.	.	50	9	20	5
SUBDOMINANT OVERSTORY TREES								
Abies grandis	.	.	30	5	50	6	20	2
Populus trichocarpa	.	.	30	11	67	10	40	3
Pinus ponderosa	.	.	.	.	33	2	40	2
UNDERSTORY TREES								
Pseudotsuga menziesii	75	1	.	.	.	.	.	.
Picea engelmannii	75	2	40	2	17	1	.	.
Populus trichocarpa	100	27	50	3	17	1	40	1
Pinus ponderosa	50	6	10	1	17	2	20	1
Abies grandis	50	1	70	9	100	13	60	4
TALL SHRUBS								
Salix rigida	50	5	10	18	.	.	.	.
Salix lasiandra	50	38	.	.	.	.	20	2
Cornus stolonifera	25	1	100	31	50	11	.	.
Alnus incana	25	3	90	26	17	5	20	13
Ribes hudsonianum	.	.	30	4	17	3	.	.
Ribes irriguum	.	.	20	12	17	4	.	.
Ribes lacustre	.	.	90	3	50	1	20	3
Alnus sinuata	.	.	20	6	33	38	.	.
Rubus parviflora	.	.	50	17	50	23	20	36
Rosa woodsii	25	1	.	.	.	.	40	3
Acer glabrum	.	.	40	5	100	29	20	1
Symphoricarpos albus	25	1	80	9	83	36	100	44
Amelanchior alnifolia	.	.	80	2	83	4	60	5
Crataegus douglasii	.	.	50	4	50	6	100	32
Philadelphus lewisii	.	.	.	.	33	7	20	30
LOW SHRUBS								
Berberis repens	.	.	.	.	33	1	40	1
PERENNIAL FORBS								
Ranunculus orthorhynchus	25	50	.	.	.	.	.	.
Taraxacum offincinale	50	3	40	1	.	.	.	.
Artemisia ludoviciana	75	1	20	1	17	1	20	1
Trautvettaria caroliniensis	.	.	50	24	.	.	.	.
Saussurea americana	.	.	20	1	.	.	.	.
Arnica cordifolia	.	.	30	2	.	.	.	.
Streptopus amplexifolius	.	.	20	3	.	.	.	.
Pyrola asarifolia	.	.	20	1	.	.	.	.
Solidago canadensis	75	1	.	.	.	.	40	1

Fragaria virginiana	25	1	30	1	.	.	20	1
Aconitum columbianum	.	.	60	1	17	1	.	.
Habenaria dilitata	.	.	30	1	17	1	.	.
Anenome piperi	.	.	30	2	17	1	.	.
Mitella pentandra	.	.	30	1	17	1	.	.
Pyrola secunda	.	.	30	1	17	1	.	.
Achillea millifolium	75	4	40	1	33	1	60	1
Trifolium repens	.	.	20	10	17	11	.	.
Fragaria vesca	25	Tr	50	2	17	1	40	2
Circaea alpina	.	.	60	4	17	1	20	6
Angelica arguta	.	.	60	2	17	1	20	2
Actaea rubra	.	.	70	1	33	1	20	1
Osmorhiza chilensis	25	1	80	2	83	2	40	2
Geum macrophyllum	.	.	60	2	33	2	20	2
Disporum hookeri	.	.	20	1	50	2	.	.
Adenocaulon bicolor	.	.	50	1	67	1	20	1
Galium triflorum	.	.	100	6	67	1	60	3
Viola glabella	.	.	70	2	67	1	40	1
Rudbeckia occidentalis	.	.	60	1	50	15	40	1
Mitella stauropetala	.	.	20	1	.	.	20	1
Thalictrum occidentale	.	.	40	5	17	2	40	39
Heracleum lanatum	.	.	60	5	33	1	60	5
Urtica dioica	.	.	40	3	67	1	40	1
Smilacina stellata	25	1	30	2	33	6	100	17
Senecio serra	.	.	10	2	.	.	60	6
PERENNIAL GRASSES								
Agrostis stolonifera	50	16	10	4	17	2	.	.
Phleum pratense	50	1	10	1	.	.	20	1
Cinna latifolia	.	.	40	3	.	.	.	.
Festuca occidentalis	.	.	30	1	.	.	.	.
Glyceria elata	.	.	50	6	17	1	.	.
Poa pratensis	75	8	30	2	.	.	60	27
Elymus glaucus	50	1	70	1	67	1	60	23
Festuca subulata	.	.	40	2	17	15	20	5
Bromus vulgaris	.	.	40	3	50	7	40	4
Dactylis glomerata	.	.	20	1	33	1	40	1
Festuca rubra	.	.	.	.	.	.	40	45
SEDGES AND RUSHES								
Scirpus microcarpus	25	25	30	15	17	1	.	.
Carex microptera	.	.	40	1	17	1	.	.
Carex deweyana	.	.	50	4	50	1	40	7
Carex geyeri	.	.	20	1	33	2	20	1
FERNS AND HORSETAILS								
Equisetum arvense	.	.	60	17	33	1	20	1

RED ALDER TYPES

	ALRU/ ATFI 2 Plots		ALRU/ PEFRP 2 Plots		ALRU/ BAR 2 Plots		ALRU/ COST 1 Plot		ALRU/ PHCA3 5 Plots		ALRU/ SYAL 2 Plots	
SPECIES	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV
DOMINANT OVERSTORY TREES												
Alnus rubra	100	75	50	50	100	83	100	40	100	69	100	33
Abies grandis	.	.	.	.	.	.	.	.	.	.	50	8
SUBDOMINANT OVERSTORY TREES												
Alnus rubra	50	10	50	16	.	.	.	.	20	5	100	30
Pseudotsuga menziesii	.	.	.	.	50	5	.	.	.	.	50	2
Abies grandis	.	.	.	.	50	2	.	.	.	.	50	1
UNDERSTORY TREES												
Alnus rubra	50	40	100	48	.	.	100	60	40	3	50	5
Abies grandis	.	.	.	.	50	1	.	.	80	1	50	3
TALL SHRUBS												
Ribes hudsonianum	.	.	.	.	50	6	.	.	.	.	.	.
Cornus stolonifera	50	40	.	.	50	10	100	50	.	.	.	.
Acer glabrum	.	.	100	5	50	7	100	1	40	23	50	1
Physocarpus capitatus	50	30	50	10	50	1	100	1	100	41	50	6
Philadelphus lewisii	50	1	100	4	50	5	100	4	100	5	100	6
Symphoricarpos albus	50	2	50	1	100	21	100	5	80	4	100	53
Rubus parviflora	.	.	100	4	100	6	100	16	60	6	100	4
Taxus brevifolia	.	.	50	8	.	.	.	.	.	.	50	1
Rhamnus purshiana	.	.	.	.	.	.	100	2	60	2	.	.
Ribes lacustre	.	.	.	.	50	5	.	.	20	3	50	1
Holodiscus discolor	.	.	.	.	.	.	100	8	.	.	50	1
Crataegus douglasii	.	.	.	.	.	.	100	1	.	.	50	15
PERENNIAL FORBS												
Trautvettaria caroliniensis	.	.	100	55	.	.	.	.	40	8	.	.
Circaea alpina	50	Tr	50	1	100	1	.	.	60	1	.	.
Angelica arguta	.	.	50	1	50	5	.	.	20	2	.	.
Galium triflorum	100	1	100	1	50	1	.	.	60	1	50	1
Ranunculus repens	.	.	.	.	100	53	.	.	.	.	.	.
Urtica dioica	100	3	100	6	.	.	100	1	40	3	50	2
Tiarella trifoliata unifoliata	50	10	100	3	.	.	.	.	80	12	50	30
Asarum caudatum	100	5	100	2	50	6	100	21	60	4	100	7
Osmorhiza chilensis	.	.	50	1	50	1	.	.	60	1	.	.
Montia cordifolia	50	Tr	100	2	50	1	100	8	80	1	50	1
Rumex crispus	50	2	50	1	.	.	.	.	60	1	50	1
Mitella pentandra	.	.	100	8	50	25	.	.	80	2	50	40
Geum macrophyllum	50	2	50	7	100	5	.	.	80	15	100	13
Heracleum lanatum	.	.	50	2	50	4	100	10	20	2	50	1
Adenocaulon bicolor	50	1	.	.	.	.	.	.	60	15	50	1
Disporum hookeri	50	2	50	2	.	.	.	.	100	4	100	5
Smilacina stellata	.	.	50	1	100	1	.	.	80	3	100	3
Viola glabella	.	.	.	.	.	.	100	1	40	1	50	1
Aconitum columbianum	.	.	.	.	.	.	.	.	60	1	.	.

Streptopus amplexifolius	.	.	.	.	.	.	.	.	40	2	.	.
PERENNIAL GRASSES												
Glyceria elata	100	3	50	3	50	2	.	.	60	1	.	.
Elymus glaucus	50	1	100	1	100	2	100	1	60	5	.	.
Cinna latifolia	50	5	100	23	50	2	.	.	40	40	50	3
Festuca subulata	50	1	50	42	50	3	100	3	80	6	100	2
Bromus vulgaris	50	1	.	.	50	1	.	.	20	1	100	1
SEDGES AND RUSHES												
Carex deweyana	100	4	100	13	.	.	100	25	60	3	100	5
FERNS AND HORSETAILS												
Athyrium filix-femina	100	53	100	3	100	3	.	.	60	6	100	5
Gymnocarpium dryopteris	50	3	50	8	50	8	.	.	40	20	50	2
Polystichum munitum	50	3	50	Tr	100	2	.	.	20	2	100	4
Equisetum arvense	.	.	.	.	.	.	.	.	60	1	.	.

WILLOW TYPES

SPECIES	SACO2/ CASC5 4 Plots CON	COV	SACO2/ CAUT 1 Plot CON	COV	SACO2/ CAPR5 1 Plot CON	COV	SAEA-SATW/ CAAQ 1 Plot CON	COV	SALIX/ CAUT 12 Plots CON	COV	SALIX/ CAAQ 10 Plots CON	COV	SALIX/ CALA3 8 Plots CON	COV
UNDERSTORY TREES														
Populus trichocarpa	.	.	.	.	.	.	.	.	.	.	.	.	.	.
TALL SHRUBS														
Salix commutata	100	65	100	20	100	50	.	.	8	3	.	.	.	.
Salix eastwoodiae	.	.	100	15	.	.	100	22	.	.	.	.	.	.
Salix tweedyi	.	.	.	.	.	.	100	22	.	.	.	.	.	.
Betula glandulosa	.	.	.	.	.	.	100	20	17	65	20	48	13	7
Salix bebbiana	.	.	.	.	.	.	.	.	8	30	.	.	13	70
Salix lemmonii	.	.	.	.	.	.	.	.	8	7	.	.	25	11
Ribes inerme	.	.	.	.	.	.	.	.	17	3	20	4	13	6
Salix boothii	.	.	.	.	.	.	.	.	75	19	80	22	88	39
Salix geyeriana	.	.	.	.	.	.	.	.	83	22	50	14	50	25
Salix drummondiana	.	.	.	.	.	.	.	.	.	.	10	1	13	5
Ribes aureum	.	.	.	.	.	.	.	.	.	.	.	.	25	21
Alnus incana	.	.	.	.	.	.	.	.	17	5	30	13	13	3
Ribes irriguum	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Salix lasiandra	.	.	.	.	.	.	.	.	8	5	10	40	13	4
Salix exigua	.	.	.	.	.	.	.	.	.	.	.	.	13	7
Salix rigida	.	.	.	.	.	.	.	.	8	12	20	12	13	25
Ribes hudsonianum	.	.	.	.	.	.	.	.	.	.	.	.	13	3
Cornus stolonifera	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Salix scouleriana	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PERENNIAL FORBS														
Gentiana calycosa	25	20	.	.	.	.	.	.	.	.	.	.	.	.
Parnassia fimbriata	50	1	.	.	100	1	.	.	.	.	.	.	.	.
Hypericum anagalloides	25	1	.	.	.	.	100	10	.	.	.	.	13	5
Pedicularis groenlandica	50	Tr	.	.	100	2	.	.	8	1	.	.	.	.
Saxifraga arguta	50	10	.	.	100	50	.	.	.	.	.	.	.	.
Arnica chamissonis	75	8	.	.	100	7	.	.	8	2	40	5	38	11
Senecio triangularis	50	10	.	.	100	30	.	.	.	.	.	.	.	.
Sanguisorba sitchensis	.	.	.	.	.	.	100	1	8	4	.	.	13	1
Aconitum columbianum	25	2	.	.	100	1	.	.	.	.	10	2	.	.
Lupinus polyphyllus	25	1	.	.	.	.	.	.	.	.	.	.	.	.
Polemonium occidentale	.	.	.	.	.	.	100	2	33	3	60	3	25	3
Prunella vulgaris	.	.	.	.	.	.	100	1	.	.	.	.	.	.
Sidalcea oregana	.	.	.	.	.	.	.	.	.	.	30	6	50	1
Galium boreale	.	.	.	.	.	.	.	.	.	.	20	1	63	4
Smilacina stellata	.	.	.	.	.	.	.	.	.	.	30	5	25	5
Solidago canadensis	.	.	.	.	.	.	100	1	8	3	10	1	25	4
Potentilla gracilis	.	.	.	.	.	.	.	.	17	1	20	1	63	4
Geum macrophyllum	.	.	.	.	100	1	.	.	58	2	40	1	88	3
Viola orbiculata	.	.	.	.	.	.	.	.	8	1	10	1	25	1
Mimulus guttatus	.	.	.	.	.	.	.	.	25	1	.	.	13	5
Fragaria virginiana	.	.	.	.	.	.	.	.	17	2	20	1	38	4
Aster spp.	.	.	.	.	.	.	.	.	17	1	30	3	38	3

Epilobium glandulosum	.	.	.	.	100	1	.	.	17	3	10	1	38	1
Ranunculus occidentalis	.	.	.	.	.	.	.	.	.	.	10	1	.	.
Taraxacum offincinale	.	.	.	.	.	.	.	.	8	1	40	1	38	1
Galium triflorum	.	.	.	.	.	.	100	1	.	.	30	2	13	1
Heracleum lanatum	.	.	.	.	.	.	.	.	.	.	.	.	13	4
Rumex crispus	.	.	.	.	.	.	.	.	17	2	20	2	25	1
Aster foliaceous	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mentha arvensis	.	.	.	.	.	.	.	.	33	4	10	20	13	2
Achillea millifolium	.	.	.	.	.	.	.	.	8	1	40	1	75	1
Ranunculus uncinatus	.	.	.	.	.	.	.	.	.	.	.	.	38	1
Aster modestus	.	.	.	.	.	.	.	.	17	1	10	1	13	2
Mimulus moschatus	25	1	.	.	.	.	.	.	.	.	10	1	.	.
Rudbeckia occidentalis	.	.	.	.	.	.	.	.	8	2	10	1	13	1
Artemisia ludoviciana	.	.	.	.	.	.	.	.	.	.	10	1	25	9
PERENNIAL GRASSES														
Puccinellia pauciflora	.	.	.	.	.	.	.	.	17	7	.	.	13	9
Calamagrostis canadensis	25	8	.	.	.	.	100	1	25	3	20	20	13	5
Poa palustris	.	.	.	.	.	.	100	1	17	3	20	24	13	1
Deschampsia cespitosa	25	1	.	.	.	.	.	.	25	1	30	11	13	1
Glyceria elata	.	.	.	.	100	5	.	.	17	1	.	.	25	4
Poa pratensis	.	.	.	.	.	.	.	.	33	5	20	13	75	25
Agrostis stolonifera	.	.	.	.	.	.	.	.	.	.	.	.	13	5
Phleum pratense	.	.	.	.	.	.	.	.	8	5	10	3	13	1
Agropyron caninum	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Alopecurus pratensis	.	.	.	.	.	.	.	.	8	1	.	.	38	1
Elymus glaucus	.	.	.	.	.	.	.	.	.	.	.	.	25	2
Bromus vulgaris	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SEDGES AND RUSHES														
Carex scopulorum	100	51	.	.	.	.	.	.	.	.	.	.	.	.
Carex praticola	.	.	.	.	100	60	.	.	.	.	.	.	13	5
Carex laeviculmis	.	.	.	.	.	.	.	.	8	25	.	.	.	.
Carex aquatilis	.	.	100	10	.	.	100	90	58	18	100	64	13	20
Carex utriculata	.	.	100	90	.	.	.	.	100	61	40	7	.	.
Juncus nevadensis	.	.	.	.	.	.	.	.	.	.	10	15	.	.
Carex lanuginosa	.	.	.	.	.	.	100	1	25	6	30	8	100	38
Carex aureum	.	.	.	.	.	.	.	.	.	.	10	1	25	1
Carex nebraskensis	.	.	.	.	.	.	.	.	8	1	20	7	25	23
Eleocharis palustris	.	.	.	.	.	.	.	.	17	3	.	.	25	11
Juncus balticus	.	.	.	.	.	.	.	.	33	20	60	16	75	8
Scirpus microcarpus	.	.	.	.	.	.	.	.	42	7	20	18	25	5
Carex petasata	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex microptera	.	.	.	.	.	.	100	1	.	.	20	9	25	2
Carex deweyana	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FERNS AND HORSETAILS														
Equisetum arvense	25	1	.	.	100	70	100	1	17	1	10	1	13	1
Athyrium filix-femina	.	.	.	.	.	.	.	.	.	.	.	.	.	.

SPECIES	SALIX/ CACA 1 Plot CON	COV	SALIX/ POPR 3 Plots CON	COV	SALIX/ MESIC FORB 4 Plots CON	COV	SAEX 9 Plots CON	COV	SARI 3 Plots CON	COV	SASC/ ELGL 1 Plot CON	COV
UNDERSTORY TREES												
Populus trichocarpa	.	.	.	.	.	.	33	9	33	7	.	.
TALL SHRUBS												
Salix commutata	.	.	.	.	.	.	.	.	.	.	.	.
Salix eastwoodiae	.	.	.	.	.	.	.	.	.	.	.	.
Salix tweedyi	.	.	.	.	.	.	.	.	.	.	.	.
Betula glandulosa	.	.	.	.	.	.	.	.	.	.	.	.
Salix bebbiana	.	.	.	.	.	.	.	.	.	.	.	.
Salix lemmonii	.	.	.	.	.	.	.	.	.	.	.	.
Ribes inerme	.	.	33	5	.	.	.	.	.	.	.	.
Salix boothii	.	.	100	47	50	65	22	5	.	.	.	.
Salix geyeriana	100	70	67	10	25	20	.	.	33	1	.	.
Salix drummondiana	.	.	.	.	.	.	11	8	.	.	.	.
Ribes aureum	.	.	33	5	25	3	.	.	.	.	.	.
Alnus incana	.	.	33	5	75	23	56	2	33	1	.	.
Ribes irriguum	.	.	33	40	.	.	11	2	.	.	.	.
Salix lasiandra	.	.	33	10	.	.	33	22	67	8	.	.
Salix exigua	.	.	33	3	.	.	89	60	.	.	.	.
Salix rigida	.	.	.	.	.	.	56	13	100	9	.	.
Ribes hudsonianum	.	.	.	.	75	24	11	2	.	.	100	2
Cornus stolonifera	.	.	.	.	25	15	33	3	33	1	100	5
Salix scouleriana	.	.	.	.	.	.	.	.	.	.	100	85
PERENNIAL FORBS												
Gentiana calycosa	.	.	.	.	.	.	.	.	.	.	.	.
Parnassia fimbriata	.	.	.	.	25	1	11	1	.	.	.	.
Hypericum anagalloides	.	.	.	.	.	.	11	4	.	.	.	.
Pedicularis groenlandica	100	3	.	.	.	.	.	.	.	.	.	.
Saxifraga arguta	.	.	.	.	75	3	.	.	.	.	.	.
Arnica chamissonis	.	.	.	.	.	.	11	3	67	2	.	.
Senecio triangularis	100	1	.	.	50	8	11	1	.	.	.	.
Sanguisorba sitchensis	.	.	.	.	50	2	.	.	.	.	.	.
Aconitum columbianum	100	1	33	1	50	1	.	.	.	.	.	.
Lupinus polyphyllus	100	15	.	.	.	.	.	.	.	.	.	.
Polemonium occidentale	100	1	33	20	50	2	.	.	.	.	.	.
Prunella vulgaris	.	.	.	.	.	.	33	2	33	1	.	.
Sidalcea oregana	.	.	33	1	.	.	.	.	.	.	.	.
Galium boreale	.	.	33	1	.	.	.	.	.	.	.	.
Smilacina stellata	.	.	33	3	.	.	.	.	.	.	.	.
Solidago canadensis	.	.	33	15	.	.	56	1	33	5	.	.
Potentilla gracilis	.	.	67	8	.	.	22	1	.	.	.	.
Geum macrophyllum	100	1	33	2	75	3	33	1	.	.	100	2
Viola orbiculata	.	.	.	.	25	1	11	1	.	.	.	.
Mimulus guttatus	.	.	.	.	25	1	22	1	.	.	.	.
Fragaria virginiana	.	.	67	1	50	1	11	1	.	.	.	.
Aster spp.	.	.	33	5	25	1	44	2	.	.	.	.
Epilobium glandulosum	.	.	.	.	100	1	22	1	.	.	100	1
Ranunculus occidentalis	.	.	.	.	.	.	11	1	.	.	.	.

Taraxacum offincinale	.	.	.	.	25	1	33	1	33	1	.	.
Galium triflorum	.	.	33	2	75	2	44	1	.	.	100	1
Heracleum lanatum	.	.	33	2	25	50	.	.	.	.	.	.
Rumex crispus	.	.	33	2	.	.	44	2	33	3	.	.
Aster foliaceous	100	1	.	.	.	.	11	3	33	4	.	.
Mentha arvensis	.	.	.	.	25	1	44	1	33	8	.	.
Achillea millifolium	.	.	67	1	25	1	56	1	100	1	.	.
Ranunculus uncinatus	.	.	33	1	25	2	11	1	33	1	.	.
Aster modestus	100	4	.	.	25	1	44	4	33	1	100	4
Mimulus moschatus	.	.	.	.	50	25	11	1	.	.	100	1
Rudbeckia occidentalis	.	.	.	.	.	.	44	2	67	1	.	.
Artemisia ludoviciana	.	.	.	.	.	.	56	4	100	8	.	.
PERENNIAL GRASSES												
Puccinellia pauciflora	.	.	.	.	.	.	.	.	.	.	.	.
Calamagrostis canadensis	100	80	.	.	25	5	22	1	.	.	.	.
Poa palustris	.	.	.	.	25	15	.	.	67	14	.	.
Deschampsia cespitosa	100	2	.	.	.	.	11	3	.	.	100	7
Glyceria elata	.	.	.	.	100	14	56	1	.	.	100	2
Poa pratensis	.	.	67	13	25	3	22	1	67	1	100	1
Agrostis stolonifera	.	.	33	15	.	.	44	13	33	30	.	.
Phleum pratense	.	.	33	15	.	.	11	2	100	4	.	.
Agropyron caninum	.	.	33	10	.	.	.	.	67	3	.	.
Alopecurus pratensis	.	.	.	.	.	.	.	.	.	.	100	3
Elymus glaucus	.	.	33	1	.	.	44	3	33	1	100	70
Bromus vulgaris	.	.	.	.	.	.	.	.	.	.	100	5
SEDGES AND RUSHES												
Carex scopulorum	.	.	.	.	.	.	.	.	.	.	.	.
Carex praticola	.	.	.	.	.	.	.	.	.	.	.	.
Carex laeviculmis	.	.	.	.	.	.	.	.	.	.	.	.
Carex aquatilis	100	7	.	.	.	.	.	.	.	.	.	.
Carex utriculata	100	2	.	.	.	.	.	.	.	.	.	.
Juncus nevadensis	.	.	.	.	.	.	.	.	.	.	.	.
Carex lanuginosa	.	.	.	.	.	.	11	2	33	1	.	.
Carex aureum	.	.	.	.	.	.	.	.	.	.	.	.
Carex nebraskensis	.	.	.	.	.	.	11	1	.	.	.	.
Eleocharis palustris	.	.	.	.	.	.	11	6	.	.	.	.
Juncus balticus	100	1	33	50	.	.	11	2	.	.	.	.
Scirpus microcarpus	.	.	.	.	.	.	.	.	33	1	.	.
Carex petasata	.	.	33	20	.	.	.	.	.	.	.	.
Carex microptera	.	.	.	.	.	.	33	2	67	8	100	3
Carex deweyana	.	.	.	.	25	10	.	.	.	.	.	.
FERNS AND HORSETAILS												
Equisetum arvense	100	1	33	1	50	3	78	12	33	5	100	2
Athyrium filix-femina	.	.	.	.	25	5	11	1	.	.	.	.

SITKA AND MOUNTAIN ALDER TYPES

SPECIES	ALSI/ ATFI 13 Plots CON	COV	ALSI/ CILA2 6 Plots CON	COV	ALSI/ MESIC FORB 4 Plots CON	COV	ALIN/ CAAM 7 Plots CON	COV	ALIN/ CAUT 6 Plots CON	COV	ALIN/ CAAQ 1 Plot CON	COV	ALIN/ CALU 1 Plot CON	COV	ALIN/ CALA3 3 Plots CON	COV	ALIN/ CACA 3 Plots CON	COV	ALIN/ SCMI 2 Plots CON	COV
UNDERSTORY TREES																				
Picea engelmannii	46	3	50	5	25	1	.	.	.	.	.	.	.	.	.	.	67	2	.	.
Abies grandis	23	3	67	1	50	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
TALL SHRUBS																				
Alnus sinuata	100	76	100	38	100	71	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lonicera involucrata	15	3	.	.	.	.	.	.	33	6	.	.	.	.	33	1	.	.	.	.
Rubus parviflora	62	5	67	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ribes hudsonianum	38	6	67	17	25	1	43	14	17	15	.	.	.	.	33	5	33	1	50	20
Ribes irriguum	8	4	33	9	.	.	.	.	.	.	.	.	.	.	33	10	.	.	.	.
Ribes lacustre	77	9	67	7	.	.	29	5	.	.	.	.	.	.	.	.	.	.	50	5
Symphoricarpos albus	15	3	.	.	25	2	29	5	.	.	.	.	.	.	100	4	.	.	50	2
Rosa gymnocarpa	.	.	33	2	25	2	14	2	.	.	.	.	.	.	.	.	.	.	.	.
Acer glabrum	15	5	17	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Alnus incana	8	60	17	40	25	75	100	60	100	32	.	.	100	50	100	57	100	47	100	53
Rubus idaeus	.	.	50	12	.	.	14	2	.	.	.	.	.	.	.	.	33	4	.	.
Cornus stolonifera	.	.	17	5	.	.	29	12	.	.	.	.	.	.	33	80	.	.	.	.
Prunus virginiana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Betula occidentalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rhamnus alnifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PERENNIAL FORBS																				
Hypericum anagalloides	.	.	.	.	.	.	14	30	17	40	.	.	.	.	.	.	.	.	.	.
Habenaria dilitata	.	.	33	1	50	1	43	1	17	1	.	.	.	.	.	.	67	1	50	1
Saxifraga arguta	62	3	83	6	50	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Streptopus amplexifolius	85	7	67	2	25	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mitella pentandra	77	30	67	2	50	1	14	2	.	.	.	.	.	.	.	.	.	.	.	.
Epilobium glandulosum	54	2	50	3	25	1	57	1	50	3	.	.	.	.	.	.	33	1	100	2
Rudbeckia occidentalis	54	7	.	.	75	2	14	1	33	1	.	.	.	.	.	.	100	9	.	.
Prunella vulgaris	15	1	17	3	.	.	29	1	.	.	.	.	100	1	33	1	.	.	.	.
Mertensia ciliata	31	1	33	5	25	2	14	1	.	.	.	.	.	.	.	.	.	.	.	.
Angelica arguta	38	5	67	2	50	6	43	3	17	1	.	.	.	.	.	.	100	3	.	.
Polemonium occidentale	.	.	17	2	.	.	.	.	50	2	.	.	.	.	33	3	33	1	50	4
Mimulus moschatus	.	.	33	2	.	.	57	1	.	.	.	.	.	.	.	.	33	2	.	.
Mimulus guttatus	.	.	33	1	50	1	71	2	33	1	.	.	.	.	.	.	.	.	50	2
Thalictrum occidentale	54	1	33	2	50	4	14	4	17	2	100	2	.	.	.	.	.	.	.	.
Mentha arvensis	.	.	17	1	.	.	29	1	50	2	.	.	.	.	33	1	33	30	.	.
Senecio triangularis	62	7	67	2	50	1	.	.	.	.	100	2	.	.	.	.	33	1	.	.
Montia cordifolia	85	2	50	3	75	17	14	5	.	.	.	.	.	.	.	.	.	.	.	.
Trautvettaria caroliniensis	46	10	17	35	25	5	.	.	17	1	.	.	.	.	.	.	.	.	.	.
Tiarella trifoliata unifoliata	62	11	67	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Geum macrophyllum	62	1	67	2	75	1	43	2	50	3	100	1	100	1	100	1	100	1	100	2
Aconitum columbianum	77	1	17	1	25	4	14	1	33	2	100	1	.	.	33	3	33	1	50	1
Actaea rubra	54	3	33	1	25	3	.	.	17	1	.	.	.	.	.	.	.	.	.	.
Veronica americana	.	.	17	2	.	.	43	2	67	6	.	.	.	.	.	.	.	.	50	1
Galium triflorum	92	1	83	1	100	1	57	2	17	1	100	1	.	.	33	15	100	1	50	1
Potentilla gracilis	.	.	.	.	.	.	.	.	.	.	.	.	100	1	.	.	.	.	.	.

Circaea alpina	85	6	67	4	50	43	29	1	.	.	.	.	.	.	.	.	.	.	.	.
Fragaria virginiana	.	.	17	1	.	.	.	.	17	1	.	.	100	1	33	2	.	.	100	1
Smilacina stellata	38	2	33	1	50	9	43	2	33	7	100	1	.	.	33	90	33	12	100	1
Viola glabella	54	2	17	2	100	6	.	.	33	1	.	.	.	.	.	.	.	.	.	.
Aster modestus	15	1	17	1	.	.	43	5	.	.	.	.	.	.	.	.	33	2	.	.
Arnica cordifolia	23	1	50	2	25	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Fragaria vesca	23	Tr	17	1	25	1	29	1	.	.	.	.	.	.	.	.	.	.	50	1
Adenocaulon bicolor	31	1	17	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Urtica dioica	77	2	33	5	50	3	14	1	.	.	.	.	.	.	.	.	33	1	.	.
Parnassia fimbriata	.	.	.	.	25	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Heracleum lanatum	38	2	50	4	75	25	14	30	.	.	.	.	.	.	.	.	67	2	.	.
Osmorhiza chilensis	69	1	50	2	50	2	.	.	17	1	.	.	.	.	.	.	67	1	.	.
Senecio pseudareus	.	.	17	10	.	.	.	.	17	13	.	.	.	.	.	.	33	5	.	.
Ranunculus uncinatus	15	1	17	1	25	1	.	.	.	.	.	.	.	.	.	.	33	1	50	1
PERENNIAL GRASSES																				
Muhlenbergia filiformis	.	.	.	.	.	.	.	.	.	.	100	2	100	20	.	.	.	.	.	.
Cinna latifolia	92	5	100	20	75	6	14	6	.	.	.	.	.	.	.	.	.	.	.	.
Puccinellia pauciflora	.	.	.	.	.	.	.	.	33	8	.	.	.	.	.	.	.	.	50	2
Glyceria elata	23	3	67	12	25	4	100	31	33	1	100	3	.	.	33	2	100	11	50	2
Calamagrostis canadensis	.	.	.	.	25	3	.	.	17	1	.	.	.	.	.	.	100	55	.	.
Poa pratensis	.	.	.	.	.	.	.	.	33	6	.	.	100	1	100	4	.	.	.	.
Festuca subulata	8	6	33	3	25	7	14	4	.	.	.	.	.	.	.	.	33	1	50	1
Elymus glaucus	.	.	33	7	50	3	14	1	.	.	.	.	.	.	.	.	33	2	.	.
Bromus vulgaris	8	6	.	.	50	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trisetum canescens	.	.	.	.	.	.	14	1	.	.	.	.	.	.	.	.	.	.	.	.
SEDGES AND RUSHES																				
Carex cusickii	.	.	.	.	.	.	.	.	50	14	.	.	.	.	.	.	.	.	.	.
Carex aquatilis	.	.	.	.	.	.	.	.	33	37	100	70	.	.	.	.	.	.	.	.
Carex lanuginosa	.	.	.	.	.	.	29	28	33	28	.	.	.	.	100	22	.	.	.	.
Carex luzulina	.	.	.	.	25	1	.	.	.	.	.	.	100	60	.	.	.	.	.	.
Carex amplifolia	8	1	.	.	.	.	100	53	.	.	.	.	.	.	.	.	.	.	.	.
Carex utriculata	.	.	.	.	.	.	14	2	100	43	.	.	.	.	33	1	.	.	.	.
Carex lenticularis lenticularis	.	.	.	.	.	.	29	2	17	60	.	.	.	.	.	.	.	.	.	.
Carex disperma	8	1	.	.	.	.	29	2	17	10	100	5	.	.	.	.	33	5	.	.
Juncus balticus	.	.	.	.	.	.	.	.	33	8	.	.	100	30	67	19	.	.	.	.
Scirpus microcarpus	.	.	33	2	.	.	57	3	50	3	.	.	.	.	33	1	33	20	100	63
Juncus ensifolius	.	.	.	.	25	1	43	1	17	1	.	.	.	.	33	1	.	.	50	1
Carex microptera	.	.	.	.	25	1	43	1	17	1	.	.	.	.	33	25	33	1	.	.
Carex deweyana	23	2	17	6	25	1	29	1	.	.	.	.	.	.	.	.	.	.	.	.
FERNS AND HORSETAILS																				
Cystopteris fragilis	15	Tr	33	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Athyrium filix-femina	100	41	67	2	50	2	43	19	.	.	.	.	.	.	.	.	33	2	.	.
Gymnocarpium dryopteris	38	44	17	20	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Equisetum arvense	.	.	33	1	25	1	43	2	33	1	.	.	.	.	33	1	100	1	100	2

SPECIES	ALIN/ ATFI 10 Plots CON	COV	ALIN/ GLEL 13 Plots CON	COV	ALIN-COST/ MESIC FORB 17 Plots CON	COV	ALIN-RIBES/ MESIC FORB 14 Plots CON	COV	ALIN/ EQAR 4 Plots CON	COV	ALIN/ GYDR 2 Plots CON	COV	ALIN/ HELA 4 Plots CON	COV	ALIN/ CALEL2 1 Plots CON	COV	ALIN- SYAL 9 Plots CON	COV	ALIN/ CADE 4 Plots CON	COV	ALIN/ POPR 8 Plots CON	COV
UNDERSTORY TREES																						
Picea engelmannii	40	1	38	5	12	2	57	3	24	1	100	2	.	.	.	.	11	7	25	1	38	6
Abies grandis	60	2	23	4	35	4	36	2	25	2	50	15	25	20	.	.	22	3	50	3	25	5
TALL SHRUBS																						
Alnus sinuata	20	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	13	5
Lonicera involucrata	10	1	8	4	.	.	.	.	25	5	.	.	.	.	.	.	11	1	.	.	25	2
Rubus parviflora	60	3	.	.	35	12	7	3	.	.	50	9	25	1	.	.	11	30	50	30	.	.
Ribes hudsonianum	80	17	85	19	59	6	100	27	50	1	50	4	.	.	100	2	44	4	50	3	38	5
Ribes irriguum	.	.	.	.	6	6	.	.	.	.	.	.	.	.	.	.	11	5	.	.	50	2
Ribes lacustre	70	10	54	7	76	15	93	13	.	.	100	10	.	.	100	4	56	15	50	3	.	.
Symphoricarpos albus	6	3	23	11	59	15	36	7	50	1	.	.	.	.	100	2	100	46	25	5	13	2
Rosa gymnocarpa	30	3	15	5	24	3	29	1	.	.	50	2	.	.	.	.	33	7	.	.	13	1
Acer glabrum	20	23	15	45	29	6	7	15	.	.	.	.	.	.	.	.	22	5	.	.	13	2
Alnus incana	100	53	100	63	100	60	100	63	100	41	100	83	100	79	100	50	100	66	100	88	100	51
Rubus idaeus	20	1	.	.	35	8	7	15	.	.	50	1	25	3	.	.	22	2	25	35	13	25
Cornus stolonifera	50	10	15	7	100	44	43	7	50	2	.	.	25	4	100	3	67	6	75	5	25	11
Prunus virginiana	.	.	.	.	12	3	.	.	.	.	.	.	.	.	.	.	11	30	.	.	.	.
Betula occidentalis	.	.	.	.	6	30	.	.	.	.	.	.	.	.	.	.	11	35	.	.	.	.
Rhamnus alnifolia	.	.	.	.	6	3	7	65	.	.	.	.	.	.	.	.	11	1	.	.	25	6
PERENNIAL FORBS																						
Hypericum anagalloides	.	.	.	.	.	.	7	60	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Habenaria dilitata	10	1	8	1	.	.	29	1	50	1	.	.	.	.	100	1	.	.	.	.	13	1
Saxifraga arguta	60	2	46	9	6	1	71	9	50	5	.	.	.	.	.	.	11	3	.	.	13	1
Streptopus amplexifolius	50	1	38	2	41	2	57	5	.	.	.	.	.	.	.	.	11	3	25	1	.	.
Mitella pentandra	70	14	46	6	18	4	64	2	25	5	50	5	.	.	.	.	11	1	.	.	.	.
Epilobium glandulosum	70	1	23	3	18	1	36	1	50	1	.	.	.	.	.	.	.	.	25	1	25	3
Rudbeckia occidentalis	40	1	15	2	12	2	7	1	25	1	.	.	.	.	.	.	11	1	50	1	25	2
Prunella vulgaris	30	1	23	1	12	1	21	Tr	50	1	.	.	.	.	100	4	11	1	.	.	13	2
Mertensia ciliata	40	5	.	.	18	1	29	1	.	.	.	.	.	.	.	.	11	25	25	3	13	5
Angelica arguta	40	1	23	2	53	2	43	2	.	.	.	.	25	3	.	.	44	12	25	1	38	3
Polemonium occidentale	10	1	8	1	6	1	21	3	.	.	.	.	.	.	.	.	11	1	.	.	25	2
Mimulus moschatus	50	1	54	2	6	1	57	1	75	1	.	.	.	.	100	5	.	.	.	.	.	.
Mimulus guttatus	40	1	38	1	.	.	29	1	100	1	.	.	25	1	100	1	.	.	50	1	13	3
Thalictrum occidentale	30	1	.	.	12	1	50	2	.	.	50	1	75	3	.	.	22	4	.	.	50	2
Mentha arvensis	10	1	46	3	24	1	.	.	50	14	.	.	50	1	100	7	.	.	.	.	25	2
Senecio triangularis	60	3	15	6	6	1	57	12	50	1	50	1	50	2	.	.	22	1	75	1	25	16
Montia cordifolia	70	6	23	3	18	1	29	6	25	2	100	2	.	.	.	.	33	4	75	2	13	1
Trautvettaria caroliniensis	20	1	8	3	18	17	14	36	25	1	100	13	.	.	.	.	.	.	.	.	13	5
Tiarella trifoliata unifoliata	40	5	8	1	18	3	.	.	.	.	100	6	.	.	.	.	11	1	50	2	.	.
Geum macrophyllum	80	4	100	2	71	2	86	2	75	3	100	1	75	3	100	1	56	3	75	2	75	3
Aconitum columbianum	60	1	54	1	24	2	64	2	50	1	50	1	25	1	.	.	67	7	.	.	50	3
Actaea rubra	30	1	23	2	24	1	43	3	.	.	.	.	25	1	.	.	22	1	50	2	.	.
Veronica americana	60	2	62	4	18	2	50	3	50	3	.	.	25	2	.	.	.	.	.	.	13	3
Galium triflorum	100	2	69	4	82	3	86	2	75	2	100	1	100	7	.	.	56	7	75	4	88	2
Potentilla gracilis	.	.	8	1	6	1	7	1	25	1	.	.	.	.	.	.	.	.	.	.	38	2
Circaea alpina	90	6	54	5	47	12	57	14	.	.	100	21	50	18	.	.	44	4	50	9	13	1
Fragaria virginiana	10	1	15	1	18	1	29	4	25	1	.	.	.	.	.	.	11	1	25	1	50	2

Smilacina stellata	60	1	8	1	29	2	43	2	50	1	100	4	100	17	.	.	44	3	50	1	50	25
Viola glabella	40	2	23	1	35	1	21	5	75	4	100	31	.	.	.	.	33	2	50	2	50	1
Aster modestus	40	2	23	12	12	1	21	8	.	.	.	.	25	20	.	.	11	2	25	2	25	6
Arnica cordifolia	30	1	31	4	18	12	50	9	50	3	50	2	.	.	.	.	44	7	.	.	13	1
Fragaria vesca	30	1	31	1	35	1	43	1	75	1	50	1	.	.	100	1	22	1	50	1	25	1
Adenocaulon bicolor	70	1	38	9	12	1	21	3	.	.	50	1	.	.	.	.	11	1	25	1	.	.
Urtica dioica	60	3	46	2	65	3	7	1	24	1	50	1	100	5	.	.	33	4	75	1	50	5
Parnassia fimbriata	20	2	15	2	.	.	29	2	50	6	.	.	.	.	.	.	.	.	25	1	.	.
Heracleum lanatum	50	6	23	1	18	1	43	2	.	.	50	1	100	26	.	.	56	2	75	3	63	8
Osmorhiza chilensis	20	1	38	1	41	1	64	2	25	1	100	1	50	7	.	.	56	1	100	2	50	1
Senecio pseudareus	.	.	8	6	.	.	14	1	.	.	.	.	.	.	.	.	11	3	.	.	50	5
Ranunculus uncinatus	30	1	15	1	18	1	50	1	25	1	50	1	25	9	.	.	22	1	25	1	50	1
PERENNIAL GRASSES																						
Muhlenbergia filiformis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cinna latifolia	90	20	31	4	47	5	79	2	25	2	50	1	.	.	.	.	33	4	25	1	.	.
Puccinellia pauciflora	10	1	8	4	.	.	7	4	.	.	.	.	.	.	100	8	.	.	.	.	13	6
Glyceria elata	70	3	100	30	71	3	86	3	100	33	.	.	25	8	.	.	22	1	25	2	50	2
Calamagrostis canadensis	.	.	8	3	6	1	.	.	25	4	.	.	25	2	.	.	11	1	.	.	13	3
Poa pratensis	.	.	23	2	35	4	.	.	50	3	.	.	50	5	.	.	33	7	25	1	88	46
Festuca subulata	10	4	8	2	24	3	14	3	25	1	50	1	50	2	.	.	11	2	50	18	38	4
Elymus glaucus	.	.	15	1	41	1	14	1	25	4	.	.	50	2	.	.	44	9	75	1	50	13
Bromus vulgaris	30	5	15	4	24	3	50	8	25	1	50	6	.	.	.	.	33	7	50	1	13	2
Trisetum canescens	.	.	15	2	12	2	7	5	.	.	.	.	.	.	.	.	.	.	25	8	13	1
SEDGES AND RUSHES																						
Carex cusickii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		
Carex aquatilis	.	.	.	.	.	.	.	.	25	1	.	.	.	.	.	.	.	.	.	.	.	.
Carex lanuginosa	.	.	8	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex luzulina	.	.	.	.	.	.	.	.	25	1	.	.	.	.	.	.	.	.	.	.	.	.
Carex amplifolia	10	3	23	3	.	.	7	4	25	2	.	.	.	.	.	.	.	.	.	.	.	.
Carex utriculata	10	2	.	.	6	20	.	.	.	.	.	.	.	.	.	.	11	1	.	.	13	3
Carex lenticularis lenticularis	.	.	31	3	.	.	7	12	.	.	.	.	.	.	100	20	.	.	.	.	.	.
Carex disperma	20	8	31	12	6	1	50	6	.	.	.	.	.	.	.	.	11	1	.	.	.	.
Juncus balticus	.	.	.	.	.	.	.	.	25	1	.	.	.	.	.	.	11	1	.	.	38	14
Scirpus microcarpus	.	.	31	8	12	1	.	.	50	1	.	.	25	3	.	.	11	1	25	2	13	3
Juncus ensifolius	.	.	31	6	2	7	1	.	100	2	.	.	.	.	.	.	25	1	.	.		
Carex microptera	10	1	31	4	6	2	36	2	75	3	.	.	50	8	.	.	22	1	50	1	13	1
Carex deweyana	60	4	23	2	29	13	57	2	50	1	50	1	.	.	.	.	67	21	100	13	.	.
FERNS AND HORSETAILS																						
Cystopteris fragilis	.	.	.	.	12	1	7	1	.	.	.	.	.	.	.	.	11	1	.	.	.	.
Athyrium filix-femina	100	31	31	6	24	7	29	3	.	.	100	2	.	.	.	.	.	.	75	4	.	.
Gymnocarpium dryopteris	20	38	.	.	6	15	.	.	.	.	100	18	.	.	.	.	.	.	.	.	.	.
Equisetum arvense	10	2	46	15	29	2	21	2	100	48	.	.	25	5	.	.	33	1	75	9	63	1

REMAINING SHRUB TYPES

SPECIES	RIBES/ CILA2 5 Plots CON	COV	RIBES/ GLEL 3 Plots CON	COV	RIBES/ MESIC FORB 4 Plots CON	COV	COST/ SAAR4 2 Plots CON	COV	COST 9 Plots CON	COV	BEOC/ CAREX 2 Plots CON	COV	BEOC/ MESIC FORB 3 Plots CON	COV	RHAL2/ MESIC FORB 1 Plot CON	COV
UNDERSTORY TREES																
Picea engelmannii	60	2	67	1	50	6	100	3	22	3	.	.	.	.	.	.
Abies grandis	60	1	67	2	75	2	50	1	56	2	.	.	.	.	.	.
TALL SHRUBS																
Taxus brevifolia	40	3	.	.	.	.	50	1	.	.	.	.	.	.	.	.
Ribes wolfii	.	.	.	.	25	10	.	.	.	.	.	.	.	.	.	.
Ribes lacustre	100	13	100	21	75	14	100	3	78	4	.	.	.	.	.	.
Ribes hudsonianum	60	39	67	46	50	43	100	11	44	16	50	15	33	80	100	4
Rosa nutkana	.	.	.	.	25	2	.	.	11	10	.	.	.	.	.	.
Rubus parviflora	40	12	33	3	25	8	.	.	33	2	.	.	.	.	.	.
Cornus stolonifera	20	1	.	.	.	.	100	25	100	68	50	23	33	1	.	.
Rosa gymnocarpa	20	1	67	1	50	2	.	.	22	2	.	.	67	4	.	.
Alnus incana	.	.	33	12	25	10	50	2	22	4	50	7	67	16	.	.
Philadelphus lewisii	.	.	.	.	.	.	50	8	.	.	.	.	33	10	.	.
Betula occidentalis	.	.	.	.	.	.	.	.	.	.	100	43	100	68	.	.
Ribes irriguum	.	.	.	.	25	25	.	.	.	.	.	.	33	8	.	.
Acer glabrum	40	6	.	.	.	.	50	4	33	26	.	.	33	1	.	.
Symphoricarpos albus	.	.	.	.	25	50	.	.	78	8	50	1	67	16	100	5
Rhamnus alnifolia	.	.	.	.	.	.	.	.	11	5	.	.	.	.	100	95
Crataegus douglasii	.	.	.	.	.	.	.	.	11	6	.	.	67	10	.	.
Amelanchior alnifolia	.	.	.	.	.	.	.	.	22	1	.	.	67	1	.	.
Rosa spp.	.	.	.	.	.	.	.	.	11	2	.	.	33	2	.	.
Rosa woodsii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Prunus virginiana	.	.	.	.	.	.	.	.	11	70	.	.	.	.	.	.
Physocarpus malvaceous	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Potentilla fruticosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Artemisia cana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Betula glandulosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Artemisia tridentata vaseyana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PERENNIAL FORBS																
Tiarella trifoliata unifoliata	60	5	.	.	.	.	50	5	11	12	.	.	.	.	.	.
Saxifraga arguta	100	6	67	12	25	1	100	58	22	2	.	.	.	.	.	.
Senecio triangularis	60	4	67	2	75	21	.	.	22	3	.	.	.	.	.	.
Mitella stauropetala	40	3	33	1	.	.	50	6	22	1	.	.	.	.	.	.
Parnassia fimbriata	.	.	33	13	50	6	50	1	11	4	.	.	.	.	.	.
Actaea rubra	60	2	67	3	25	1	50	5	67	5	.	.	.	.	.	.
Mimulus moschatus	40	1	67	1	25	1	50	5	11	1	100	3	.	.	.	.
Veronica americana	20	1	33	5	100	1	50	1	11	1	50	2	33	2	.	.
Mimulus guttatus	40	2	33	1	.	.	100	1	.	.	100	1	33	1	.	.
Angelica arguta	20	2	67	1	75	2	.	.	33	2	50	3	33	1	.	.
Epilobium glandulosum	60	4	100	2	50	1	100	3	.	.	50	1	33	1	100	1
Mitella pentandra	60	16	33	1	50	3	50	1	22	3	.	.	.	.	.	.
Circaea alpina	60	4	67	6	25	1	.	.	67	4	50	2	.	.	.	.
Montia cordifolia	80	2	.	.	25	1	50	2	11	1	.	.	.	.	100	1
Heracleum lanatum	60	6	33	2	50	10	.	.	56	3	.	.	33	1	100	12

Urtica dioica	80	6	33	1	50	1	.	.	22	1	.	.	33	2	100	4
Aconitum columbianum	100	1	67	1	75	4	50	1	56	4	.	.	67	1	.	.
Galium triflorum	60	3	67	1	100	2	100	1	78	4	50	2	67	1	100	5
Smilacina stellata	20	1	33	1	.	.	.	.	56	9	50	1	33	1	.	.
Thalictrum occidentale	40	3	33	1	75	1	.	.	33	7	.	.	.	.	100	4
Ranunculus uncinatus	20	1	.	.	50	4	.	.	.	.	50	1	.	.	.	.
Osmorhiza chilensis	40	1	.	.	75	1	.	.	44	1	.	.	100	1	.	.
Fragaria vesca	20	2	33	1	50	2	.	.	11	1	.	.	33	1	.	.
Geum macrophyllum	60	3	67	2	75	4	.	.	44	1	50	1	.	.	100	2
Aster modestus	.	.	33	5	25	2	.	.	11	4	.	.	.	.	100	1
Rudbeckia occidentalis	20	10	.	.	.	.	.	.	.	.	.	.	.	.	100	4
Smilacina racemosa	.	.	.	.	.	.	.	.	22	1	.	.	100	1	.	.
Aster conspicuus	.	.	.	.	.	.	.	.	11	2	.	.	33	25	.	.
Achillea millifolium	.	.	67	1	25	1	.	.	11	3	.	.	.	.	.	.
Aster campestris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Potentilla gracilis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Horkelia fusca	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sidalcea oregana	.	.	.	.	.	.	.	.	11	1	.	.	.	.	.	.
Penstemon rydbergii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Valeriana edulis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PERENNIAL GRASSES																
Cinna latifolia	100	25	67	3	25	2	50	2	44	5	.	.	.	.	100	2
Glyceria elata	40	4	100	24	50	3	100	6	44	12	50	3	.	.	100	3
Bromus vulgaris	.	.	67	10	25	9	50	5	33	2	.	.	.	.	100	5
Festuca subulata	.	.	.	.	.	.	50	35	22	1	.	.	.	.	.	.
Agrostis stolonifera	.	.	.	.	.	.	.	.	.	.	.	.	33	50	.	.
Elymus glaucus	20	20	.	.	.	.	.	.	22	1	.	.	67	3	100	5
Calamagrostis rubescens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Alopecurus pratensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Poa pratensis	.	.	.	.	25	1	.	.	.	.	.	.	33	40	.	.
Poa cusickii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Elymus cinereus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SEDGES AND RUSHES																
Carex utriculata	.	.	.	.	.	.	.	.	.	.	50	15	.	.	.	.
Carex cusickii	.	.	.	.	.	.	.	.	.	.	50	25	.	.	.	.
Carex amplifolia	.	.	.	.	.	.	.	.	.	.	50	8	.	.	.	.
Carex aquatilis	.	.	.	.	.	.	.	.	11	1	50	3	.	.	.	.
Carex geyeri	.	.	.	.	.	.	.	.	33	25	.	.	.	.	.	.
Carex sitchensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Juncus balticus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FERNS AND HORSETAILS																
Athyrium filix-femina	100	4	33	3	50	1	50	12	22	2	.	.	.	.	100	2
Equisetum arvense	.	.	33	5	.	.	.	.	22	1	.	.	.	.	.	.

SPECIES	CRDO 10Plots CON	COV	AMAL 2 Plots CON	COV	POFR/ DECE 2 Plots CON	COV	POFR/ POPR 8 Plots CON	COV	ARCA/ DECE 1 Plot CON	COV	ARCA/ POPR 2 Plots CON	COV	ARCA/ POCU 3 Plots CON	COV	ARTRV/ POCU 5 Plots CON	COV
UNDERSTORY TREES																
Picea engelmannii	10	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Abies grandis	30	2	50	1	.	.	.	.	.	.	.	.	.	.	.	.
TALL SHRUBS																
Taxus brevifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ribes wolfii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ribes lacustre	10	1	.	.	.	.	13	1	.	.	.	.	.	.	.	.
Ribes hudsonianum	10	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rosa nutkana	10	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rubus parviflora	10	2	50	15	.	.	.	.	.	.	.	.	.	.	.	.
Cornus stolonifera	20	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rosa gymnocarpa	10	1	50	1	.	.	.	.	.	.	.	.	.	.	.	.
Alnus incana	20	8	.	.	.	.	13	1	.	.	.	.	.	.	.	.
Philadelphus lewisii	30	13	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Betula occidentalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ribes irriguum	30	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Acer glabrum	30	4	100	7	.	.	.	.	.	.	.	.	.	.	.	.
Symphoricarpos albus	80	21	50	2	.	.	13	1	.	.	.	.	.	.	.	.
Rhamnus alnifolia	30	44	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Crataegus douglasii	100	67	50	5	.	.	.	.	.	.	.	.	.	.	.	.
Amelanchior alnifolia	50	3	100	45	.	.	.	.	.	.	.	.	.	.	.	.
Rosa spp.	40	1	50	15	.	.	.	.	.	.	.	.	.	.	.	.
Rosa woodsii	10	10	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Prunus virginiana	10	2	50	15	.	.	.	.	.	.	.	.	.	.	.	.
Physocarpus malvaceous	30	14	50	15	.	.	.	.	.	.	.	.	.	.	.	.
Potentilla fruticosa	.	.	.	.	50	10	100	37	.	.	50	3	.	.	.	.
Artemisia cana	.	.	.	.	.	.	.	.	100	80	100	38	100	47	.	.
Betula glandulosa	.	.	.	.	.	.	.	.	.	.	50	15	.	.	.	.
Artemisia tridentata vaseyana	.	.	.	.	.	.	.	.	.	.	50	5	.	.	100	67
PERENNIAL FORBS																
Tiarella trifoliata unifoliata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Saxifraga arguta	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Senecio triangularis	10	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mitella stauropetala	10	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Parnassia fimbriata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Actaea rubra	20	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mimulus moschatus	10	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Veronica americana	10	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mimulus guttatus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Angelica arguta	30	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Epilobium glandulosum	10	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mitella pentandra	20	1	50	1	.	.	.	.	.	.	.	.	.	.	.	.
Circaea alpina	30	25	50	2	.	.	.	.	.	.	.	.	.	.	.	.
Montia cordifolia	30	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Heracleum lanatum	20	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Urtica dioica	50	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aconitum columbianum	50	2	50	1	.	.	.	.	.	.	50	1	.	.	.	.

Galium triflorum	80	5	50	1	.	.	.	.	.	.	.	.	.	.	.	.
Smilacina stellata	50	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Thalictrum occidentale	60	11	50	6	.	.	.	.	.	.	.	.	.	.	.	.
Ranunculus uncinatus	20	1	50	1	.	.	.	.	.	.	.	.	.	.	.	.
Osmorhiza chilensis	70	2	50	1	.	.	.	.	.	.	.	.	.	.	.	.
Fragaria vesca	70	1	50	5	.	.	.	.	.	.	.	.	.	.	.	.
Geum macrophyllum	50	3	.	.	.	.	13	10	100	1	.	.	.	.	.	.
Aster modestus	10	1	50	1	.	.	.	.	.	.	.	.	.	.	.	.
Rudbeckia occidentalis	20	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Smilacina racemosa	40	7	50	1	.	.	.	.	.	.	.	.	.	.	.	.
Aster conspicuus	.	.	50	6	.	.	.	.	.	.	.	.	.	.	.	.
Achillea millifolium	40	1	50	1	50	15	100	11	.	.	50	2	100	1	80	1
Aster campestris	.	.	.	.	50	10	13	6	.	.	.	.	.	.	.	.
Potentilla gracilis	20	1	.	.	100	13	100	32	100	1	100	20	67	60	60	2
Horkelia fusca	.	.	.	.	.	.	.	.	100	7	50	5	.	.	.	.
Sidalcea oregana	.	.	.	.	.	.	50	5	100	1	100	1	33	5	60	1
Penstemon rydbergii	.	.	.	.	.	.	25	6	100	3	100	1	67	5	20	12
Valeriana edulis	.	.	.	.	.	.	.	.	.	.	100	5	.	.	.	.
PERENNIAL GRASSES																
Cinna latifolia	10	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Glyceria elata	10	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bromus vulgaris	20	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuca subulata	30	7	50	1	.	.	.	.	.	.	.	.	.	.	.	.
Agrostis stolonifera	10	10	.	.	.	.	13	40	.	.	.	.	.	.	.	.
Elymus glaucus	70	3	50	1	.	.	.	.	.	.	50	1	.	.	.	.
Calamagrostis rubescens	10	4	50	11	.	.	.	.	.	.	.	.	.	.	.	.
Alopecurus pratensis	.	.	.	.	100	53	13	8	.	.	.	.	.	.	.	.
Poa pratensis	40	31	.	.	100	5	100	39	.	.	100	45	.	.	20	1
Poa cusickii	.	.	.	.	.	.	.	.	100	5	.	.	67	70	100	44
Elymus cinereus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	20	20
SEDGES AND RUSHES																
Carex utriculata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex cusickii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex amplifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex aquatilis	.	.	.	.	.	.	13	2	.	.	.	.	.	.	.	.
Carex geyeri	20	9	50	15	.	.	.	.	.	.	.	.	.	.	.	.
Carex sitchensis	.	.	.	.	50	25	.	.	.	.	.	.	.	.	.	.
Juncus balticus	.	.	.	.	100	11	75	13	100	40	100	16	.	.	60	2
FERNS AND HORSETAILS																
Athyrium filix-femina	10	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Equisetum arvense	10	65	.	.	.	.	13	1	.	.	.	.	.	.	.	.

HERBACEOUS TYPES - MEADOWS

SPECIES	CASC5 16 Plots CON	CASC5 COV	CAMU2 2 Plots CON	CAMU2 COV	CAPR5 3 Plots CON	CAPR5 COV	ELPA2 5 Plots CON	ELPA2 COV	CALU 7 Plots CON	CALU COV	CAAQ 33 Plots CON	CAAQ COV	CACA4 2 Plots CON	CACA4 COV	CACU2 11 Plots CON	CACU2 COV	METR 1 Plot CON	METR COV	CAUT 39 Plots CON	CAUT COV	CALA4 1 Plot CON	CALA4 COV
TALL SHRUBS																						
Salix geyeriana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	9	2	.	.	15	6	.	.
Alnus incana	.	.	.	.	.	.	.	.	.	.	9	4	.	.	27	2	.	.	3	3	.	.
Ribes hudsonianum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Salix lasiandra	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	1	.	.
Salix boothii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	8	5	.	.
PERENNIAL FORBS																						
Dodecatheon alpinum	56	12	100	9	33	3	60	1	57	14	.	.	.	.	.	.	.	.	.	.	.	.
Senecio cymbalarioides	63	8	50	2	33	1	.	.	71	4	6	10	.	.	.	.	.	.	.	.	.	.
Potentilla flabellifolia	19	9	.	.	.	.	.	.	29	1	.	.	.	.	.	.	.	.	.	.	.	.
Hypericum anagalloides	.	.	.	.	.	.	.	.	71	20	21	16	.	.	9	22	.	.	8	30	.	.
Pedicularis groenlandica	19	1	50	1	.	.	.	.	43	1	15	6	.	.	9	1	.	.	8	9	.	.
Dodecatheon jeffreyi	6	Tr	.	.	.	.	20	3	57	13	6	6	.	.	.	.	.	.	.	.	.	.
Menyanthes trifoliata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	70	.	.	100	3
Habenaria dilitata	6	1	50	1	.	.	.	.	57	Tr	9	1	50	1	36	1	.	.	15	1	.	.
Senecio foetidus	.	.	.	.	.	.	.	.	.	.	3	3	50	30	.	.	.	.	3	3	.	.
Allium validum	25	39	.	.	.	.	.	.	14	1	9	2	.	.	27	1	.	.	3	25	.	.
Cicuta douglasii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	18	2	100	4	5	5	.	.
Stellaria longipes	.	.	.	.	.	.	.	.	14	1	15	2	50	1	9	1	.	.	5	1	.	.
Cerastium nutans	.	.	.	.	.	.	.	.	57	1	9	2	.	.	.	.	.	.	5	1	.	.
Sanguisorba sitchensis	6	1	.	.	.	.	.	.	29	1	9	23	.	.	18	2	.	.	8	14	.	.
Saxifraga arguta	13	5	.	.	.	.	.	.	.	.	.	.	.	.	9	1	.	.	3	1	.	.
Polemonium occidentale	.	.	.	.	33	1	.	.	.	.	33	7	.	.	73	5	.	.	28	3	.	.
Epilobium glandulosum	13	1	.	.	.	.	20	1	14	10	48	3	.	.	27	1	.	.	26	5	.	.
Aster foliaceous	13	1	.	.	.	.	.	.	14	45	.	.	50	3	9	1	.	.	3	1	.	.
Geum macrophyllum	.	.	.	.	.	.	20	3	43	3	48	3	50	1	36	1	.	.	18	3	.	.
Veronica americana	.	.	.	.	.	.	20	6	.	.	21	1	.	.	9	3	.	.	23	5	.	.
Mimulus guttatus	6	1	.	.	.	.	20	2	.	.	12	1	.	.	18	5	.	.	5	1	.	.
Mimulus moschatus	6	1	.	.	.	.	.	.	.	.	33	3	.	.	.	.	.	.	8	5	.	.
Epilobium watsonii	.	.	.	.	.	.	.	.	14	5	15	6	.	.	.	.	.	.	5	15	.	.
Mentha arvensis	.	.	.	.	.	.	.	.	.	.	15	1	.	.	.	.	.	.	13	3	.	.
Galium triflorum	.	.	.	.	.	.	.	.	.	.	15	2	.	.	9	Tr	.	.	13	Tr	.	.
Taraxacum officinale	.	.	.	.	33	2	.	.	.	.	3	1	.	.	9	1	.	.	5	1	.	.
Potentilla gracilis	.	.	.	.	67	35	40	1	.	.	12	3	.	.	.	.	.	.	10	3	.	.
Trifolium longipes	6	1	.	.	.	.	.	.	29	11	15	6	.	.	9	5	.	.	5	1	.	.
Prunella vulgaris	.	.	.	.	.	.	.	.	.	.	3	2	.	.	9	1	.	.	13	1	.	.
Polygonum bistortoides	31	8	.	.	.	.	.	.	29	1	12	5	.	.	.	.	.	.	5	3	.	.
Aster modestus	.	.	.	.	.	.	.	.	.	.	6	1	.	.	18	2	.	.	5	2	.	.
Achillea millifolium	.	.	.	.	67	6	.	.	.	.	9	1	.	.	9	Tr	.	.	10	3	.	.
Senecio integerrimus	.	.	.	.	.	.	.	.	.	.	6	24	.	.	.	.	.	.	.	.	.	.
Sidalcea oregana	.	.	.	.	.	.	.	.	14	1	3	12	.	.	.	.	.	.	3	2	.	.
Camassia quamash	.	.	.	.	.	.	.	.	.	.	3	8	.	.	.	.	.	.	.	.	.	.
Iris missouriensis	.	.	.	.	.	.	.	.	.	.	3	5	.	.	.	.	.	.	.	.	.	.
Veratrum spp.	.	.	.	.	.	.	.	.	.	.	3	20	.	.	.	.	.	.	.	.	.	.
Lemna minor	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ranunculus aquatilis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Typha latifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

PERENNIAL GRASSES																						
Calamagrostis inexpansa	.	.	.	.	.	.	.	.	.	.	3	3	.	.	.	.	.	.	3	10	.	.
Muhlenbergia filiformis	13	38	50	1	33	1	.	.	71	26	9	10	50	40	18	20	.	.	.	.	.	.
Phleum alpinum	19	Tr	.	.	.	.	.	.	71	4	18	6	.	.	9	1	.	.	10	1	.	.
Deschampsia cespitosa	69	12	100	1	.	.	40	1	100	9	42	21	50	12	9	1	100	1	7	.	.	.
Agrostis scabra	6	1	.	.	.	.	.	.	14	4	15	5	.	.	.	.	.	.	3	20	.	.
Puccinellia pauciflora	.	.	.	.	.	.	.	.	.	.	9	5	.	.	9	1	.	.	15	5	.	.
Calamagrostis canadensis	6	1	.	.	.	.	20	1	.	.	18	29	.	.	9	40	.	.	23	17	.	.
Glyceria elata	13	1	.	.	.	.	20	3	.	.	21	4	.	.	18	7	.	.	15	10	.	.
Poa pratensis	.	.	.	.	33	2	20	1	29	2	30	4	.	.	27	4	.	.	23	7	.	.
Agrostis stolonifera	.	.	.	.	.	.	.	.	.	.	6	3	.	.	.	.	.	.	8	3	.	.
Trisetum wolfii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Stipa occidentalis	6	1	.	.	33	10	.	.	.	.	3	1	.	.	.	.	.	.	.	.	.	.
Phleum pratense	.	.	.	.	.	.	.	.	.	.	9	1	50	2	.	.	.	.	13	7	.	.
Festuca rubra	.	.	.	.	.	.	.	.	.	.	3	4	.	.	.	.	.	.	8	10	.	.
Alopecurus pratensis	.	.	.	.	.	.	.	.	.	.	3	1	.	.	.	.	.	.	3	1	.	.
Agrostis diegoensis	.	.	.	.	.	.	.	.	.	.	3	6	.	.	.	.	.	.	3	1	.	.
SEDGES AND RUSHES																						
Carex scopulorum	94	62	50	1	.	.	40	30	43	5	.	.	.	.	.	.	.	.	3	80	.	.
Eleocharis pauciflora	31	35	100	23	33	30	100	85	71	14	9	19	.	.	.	.	.	.	5	1	.	.
Carex praegracilis	.	.	.	.	100	43	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex luzulina	13	1	.	.	33	1	.	.	100	47	15	11	.	.	.	.	.	.	3	5	.	.
Carex muricata	6	3	100	70	33	3	.	.	43	4	12	5	.	.	18	3	.	.	8	1	100	1
Luzula campestris multiflora	13	13	50	1	33	1	.	.	71	7	18	6	.	.	9	1	.	.	3	1	.	.
Carex canescens	.	.	.	.	.	.	.	.	.	.	6	5	100	89	9	20	.	.	5	20	.	.
Carex jonesii	6	1	.	.	.	.	.	.	71	8	9	14	.	.	18	8	.	.	10	10	.	.
Carex cusickii	.	.	.	.	.	.	.	.	.	.	6	7	.	.	100	77	100	8	10	2	.	.
Carex aquatilis	19	3	100	11	.	.	40	13	71	24	97	68	50	1	27	33	.	.	26	26	.	.
Carex utriculata	.	.	.	.	33	1	.	.	14	1	15	7	.	.	55	8	100	30	100	63	100	2
Carex lasiocarpa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	3	100	100
Carex sitchensis	6	1	.	.	.	.	.	.	.	.	3	70	.	.	.	.	.	.	.	.	.	.
Carex vesicaria vesicaria	.	.	.	.	.	.	.	.	.	.	12	9	.	.	.	.	.	.	.	.	.	.
Eleocharis bella	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex lenticularis lenticularis	.	.	.	.	.	.	.	.	14	1	3	5	50	9	.	.	.	.	8	14	.	.
Carex stipata	.	.	.	.	.	.	.	.	.	.	6	2	50	1	9	1	.	.	3	1	.	.
Juncus ensifolius	.	.	.	.	.	.	20	1	43	4	15	4	100	6	.	.	.	.	23	6	.	.
Carex lanuginosa	.	.	.	.	33	5	.	.	14	2	12	29	.	.	9	5	.	.	15	18	.	.
Eleocharis palustris	6	15	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	8	7	100	1
Scirpus microcarpus	.	.	.	.	.	.	.	.	.	.	33	12	50	1	18	22	.	.	33	25	.	.
Carex simulata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	33	.	.
Juncus balticus	.	.	.	.	33	90	20	15	14	15	36	7	100	1	36	1	.	.	33	9	.	.
Carex nebraskensis	.	.	.	.	.	.	40	40	.	.	12	28	.	.	9	2	.	.	13	38	.	.
Carex sheldonii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Juncus nevadensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	10	.	.
Juncus confusus	.	.	.	.	.	.	.	.	14	1	.	.	.	.	.	.	.	.	.	.	.	.
FERNS AND HORSETAILS																						
Equisetum arvense	.	.	.	.	.	.	20	2	43	17	18	2	100	15	36	1	.	.	21	17	.	.

SPECIES	CAVEV 13 Plots CON	COV	ELBE 1 Plot CON	COV	ELPA 10 Plots CON	COV	CALEL2 9 Plots CON	COV	CASI2 2 Plots CON	COV	CAST 2 Plots CON	COV	CALA3 9 Plots CON	COV	CASH 3 Plots CON	COV	CACA 9 Plots CON	COV	CANE 17 Plots CON	COV	DECE 29 Plots CON	COV
TALL SHRUBS																						
Salix geyeriana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Alnus incana	.	.	.	.	.	.	11	15	50	50	50	9	33	6	33	2	11	4	6	1	.	.
Ribes hudsonianum	.	.	.	.	.	.	33	7	.	.	.	.	22	8	33	2	11	2	.	.	.	.
Salix lasiandra	.	.	.	.	10	1	.	.	.	.	.	.	11	3	.	.	.	.	6	1	.	.
Salix boothii	.	.	.	.	10	1	.	.	.	.	.	.	11	1	.	.	.	.	12	5	.	.
PERENNIAL FORBS																						
Dodecatheon alpinum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	7	8
Senecio cymbalarioides	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	5
Potentilla flabellifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	22
Hypericum anagalloides	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	12	31	7	2
Pedicularis groenlandica	.	.	.	.	.	.	.	.	50	3	.	.	11	1	.	.	22	3	.	.	14	1
Dodecatheon jeffreyi	.	.	.	.	.	.	.	.	50	5	.	.	.	.	.	.	11	1	.	.	3	1
Menyanthes trifoliata	.	.	.	.	10	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Habenaria dilitata	.	.	.	.	.	.	11	1	.	.	50	1	22	3	.	.	67	1	6	2	3	1
Senecio foetidus	8	10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	24	20
Allium validum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	33	1	33	5	.	.	7	42
Cicuta douglasii	.	.	.	.	20	1	.	.	.	.	50	1	.	.	.	.	.	.	6	1	.	.
Stellaria longipes	.	.	.	.	.	.	11	1	.	.	.	.	11	Tr	.	.	11	1	.	.	7	3
Cerastium nutans	.	.	.	.	.	.	22	1	.	.	50	1	11	Tr	.	.	.	.	12	1	.	.
Sanguisorba sitchensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	56	9	.	.	7	2
Saxifraga arguta	.	.	.	.	.	.	22	1	.	.	.	.	.	.	.	.	22	1	.	.	.	.
Polemonium occidentale	.	.	.	.	.	.	33	6	.	.	50	1	22	33	33	25	67	4	18	4	7	3
Epilobium glandulosum	8	1	.	.	10	10	33	1	50	1	50	2	22	1	.	.	56	1	.	.	17	2
Aster foliaceous	23	12	.	.	.	.	11	10	.	.	.	.	11	1	.	.	11	2	.	.	24	15
Geum macrophyllum	8	Tr	.	.	.	.	22	3	.	.	50	1	67	4	33	1	56	1	12	2	7	1
Veronica americana	.	.	.	.	10	1	33	2	.	.	.	.	.	.	.	.	22	2	24	3	.	.
Mimulus guttatus	.	.	.	.	20	1	22	1	.	.	.	.	11	1	.	.	33	1	29	5	.	.
Mimulus moschatus	.	.	.	.	.	.	44	1	.	.	50	4	11	1	.	.	44	7	.	.	.	.
Epilobium watsonii	31	5	.	.	10	3	.	.	50	3	50	9	.	.	33	8	11	1	18	6	17	11
Mentha arvensis	8	54	.	.	50	12	44	6	.	.	.	.	44	7	.	.	.	.	12	14	.	.
Galium triflorum	.	.	.	.	.	.	22	1	.	.	50	1	.	.	33	10	33	1	.	.	3	5
Taraxacum officinale	.	.	.	.	10	1	22	1	.	.	.	.	11	1	.	.	33	1	12	1	7	1
Potentilla gracilis	8	15	.	.	10	1	22	4	.	.	.	.	44	3	.	.	.	.	12	2	55	13
Trifolium longipes	8	15	.	.	.	.	11	30	.	.	.	.	11	Tr	.	.	22	2	.	.	10	2
Prunella vulgaris	.	.	.	.	10	1	22	4	.	.	50	1	44	7	.	.	.	.	.	.	.	.
Polygonum bistortoides	8	8	.	.	.	.	11	15	50	1	.	.	.	.	.	.	11	1	6	5	55	5
Aster modestus	8	1	.	.	.	.	11	2	.	.	.	.	22	1	33	1	11	15	.	.	10	1
Achillea millifolium	.	.	.	.	.	.	44	3	.	.	50	1	22	1	67	2	11	2	6	1	14	2
Senecio integerrimus	8	1	.	.	10	5	11	5	.	.	.	.	.	.	.	.	.	.	.	.	24	9
Sidalcea oregana	.	.	.	.	.	.	.	.	.	.	.	.	11	1	.	.	.	.	6	1	14	9
Camassia quamash	38	7	.	.	.	.	11	15	.	.	.	.	.	.	.	.	.	.	6	1	34	7
Iris missouriensis	.	.	.	.	20	1	.	.	.	.	.	.	11	3	.	.	.	.	.	.	10	25
Veratrum spp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	7	2
Lemna minor	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ranunculus aquatilis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Typha latifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

PERENNIAL GRASSES																						
Calamagrostis inexpansa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Muhlenbergia filiformis	8	1	.	.	10	3	22	35	50	30	.	.	11	1	.	.	.	.	.	.	14	13
Phleum alpinum	.	.	.	.	.	.	11	1	.	.	50	2	.	.	.	.	33	1	.	.	28	2
Deschampsia cespitosa	77	14	100	1	10	3	33	25	100	15	50	5	22	34	33	25	44	5	35	6	100	54
Agrostis scabra	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	11	1	12	6	.	.
Puccinellia pauciflora	.	.	.	.	.	.	22	18	50	5	.	.	11	55	.	.	11	1	6	2	.	.
Calamagrostis canadensis	8	1	.	.	.	.	11	1	.	.	.	.	11	35	.	.	100	79	6	1	3	3
Glyceria elata	8	1	.	.	30	5	44	13	.	.	100	43	33	1	.	.	56	4	29	12	.	.
Poa pratensis	8	10	.	.	30	1	11	15	.	.	100	1	33	4	33	8	33	6	35	4	48	13
Agrostis stolonifera	.	.	.	.	20	33	22	3	.	.	100	1	22	11	.	.	11	1	6	20	7	1
Trisetum wolfii	15	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	2
Stipa occidentalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Phleum pratense	8	1	.	.	10	1	11	8	.	.	50	13	78	2	33	2	.	.	18	2	28	12
Festuca rubra	.	.	.	.	.	.	.	.	.	.	.	.	11	25	.	.	.	.	6	2	10	3
Alopecurus pratensis	.	.	.	.	30	4	.	.	.	.	50	3	11	1	.	.	.	.	.	.	7	9
Agrostis diegoensis	8	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6	1	24	9
SEDGES AND RUSHES																						
Carex scopulorum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6	1	14	12
Eleocharis pauciflora	.	.	.	.	10	40	11	20	.	.	.	.	.	.	.	.	.	.	.	.	3	4
Carex praegracilis	.	.	.	.	10	1	.	.	.	.	.	.	11	40	.	.	.	.	6	1	.	.
Carex luzulina	.	.	.	.	.	.	11	1	.	.	.	.	.	.	.	.	.	.	6	1	7	13
Carex muricata	.	.	.	.	10	1	.	.	.	.	.	.	.	.	.	.	11	5	.	.	.	.
Luzula campestris multiflora	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	11	2	6	1	10	1
Carex canescens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	22
Carex jonesii	.	.	.	.	.	.	11	3	.	.	.	.	11	1	.	.	.	.	6	3	3	29
Carex cusickii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6	2	.	.
Carex aquatilis	23	7	.	.	.	.	.	.	50	8	.	.	22	5	.	.	89	6	.	.	17	5
Carex utriculata	.	.	.	.	10	2	.	.	.	.	.	.	22	12	33	1	22	7	6	2	10	1
Carex lasiocarpa	.	.	.	.	10	25	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex sitchensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	11	1	.	.	.	.
Carex vesicaria vesicaria	100	61	100	4	10	15	11	15	.	.	.	.	.	.	.	.	.	.	12	8	3	5
Eleocharis bella	.	.	100	90	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex lenticularis lenticularis	8	3	.	.	.	.	100	40	.	.	.	.	11	25	.	.	.	.	6	1	10	10
Carex stipata	.	.	.	.	.	.	.	.	.	.	100	55	.	.	.	.	.	.	6	10	3	1
Juncus ensifolius	.	.	.	.	20	1	22	4	.	.	.	.	56	4	.	.	33	2	29	2	10	6
Carex lanuginosa	8	1	.	.	30	2	11	18	.	.	.	.	100	50	33	5	11	5	.	.	7	10
Eleocharis palustris	15	18	.	.	90	62	.	.	.	.	50	1	11	10	33	1	.	.	18	8	3	5
Scirpus microcarpus	.	.	.	.	30	5	22	31	.	.	100	20	44	21	.	.	67	22	6	30	.	.
Carex simulata	8	5	.	.	.	.	.	.	100	70	.	.	.	.	.	.	.	.	6	13	.	.
Juncus balticus	46	9	.	.	20	6	44	13	100	10	.	.	44	16	67	8	22	31	65	16	66	21
Carex nebraskensis	46	31	.	.	10	1	.	.	50	35	.	.	22	7	.	.	.	.	100	71	28	21
Carex sheldonii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	86	.	.	.	.	3	15
Juncus nevadensis	.	.	.	.	.	.	11	1	.	.	.	.	.	.	33	10	.	.	6	5	3	1
Juncus confusus	.	.	.	.	10	10	.	.	.	.	.	.	11	3	.	.	.	.	.	.	7	8
FERNS AND HORSETAILS																						
Equisetum arvense	8	3	100	6	20	16	11	5	.	.	.	.	33	14	.	.	67	1	6	2	10	1

SPECIES	VERAT 1 Plot CON	COV	JUBA 15 Plots CON	COV	AGDI 4 Plots CON	COV	POPR 10 Plots CON	COV	ALPR 5 Plots CON	COV	TYLA 1 Plot CON	COV
TALL SHRUBS												
Salix geyeriana	.	.	13	1	.	.	.	.	.	.	.	.
Alnus incana	.	.	13	3	.	.	10	4	20	1	.	.
Ribes hudsonianum	.	.	.	.	.	.	.	.	.	.	.	.
Salix lasiandra	.	.	13	1	.	.	.	.	.	.	.	.
Salix boothii	.	.	13	3	.	.	10	1	.	.	.	.
PERENNIAL FORBS												
Dodecatheon alpinum	.	.	.	.	.	.	.	.	.	.	.	.
Senecio cymbalarioides	.	.	.	.	.	.	.	.	.	.	.	.
Potentilla flabellifolia	.	.	.	.	.	.	.	.	.	.	.	.
Hypericum anagalloides	.	.	7	1	.	.	.	.	.	.	.	.
Pedicularis groenlandica	.	.	.	.	.	.	.	.	.	.	.	.
Dodecatheon jeffreyi	.	.	7	5	.	.	.	.	.	.	.	.
Menyanthes trifoliata	.	.	.	.	.	.	.	.	.	.	.	.
Habenaria dilitata	.	.	7	1	.	.	.	.	.	.	.	.
Senecio foetidus	.	.	.	.	.	.	.	.	.	.	.	.
Allium validum	.	.	.	.	.	.	.	.	.	.	.	.
Cicuta douglasii	.	.	.	.	.	.	.	.	.	.	.	.
Stellaria longipes	.	.	.	.	.	.	.	.	20	1	.	.
Cerastium nutans	.	.	7	7	.	.	.	.	.	.	.	.
Sanguisorba sitchensis	.	.	.	.	.	.	.	.	.	.	.	.
Saxifraga arguta	.	.	.	.	.	.	.	.	.	.	.	.
Polemonium occidentale	.	.	27	20	.	.	.	.	.	.	.	.
Epilobium glandulosum	.	.	13	1	.	.	10	1	20	1	.	.
Aster foliaceous	.	.	13	2	25	5	10	3	.	.	.	.
Geum macrophyllum	.	.	47	4	.	.	10	2	20	2	.	.
Veronica americana	.	.	20	1	.	.	10	2	.	.	.	.
Mimulus guttatus	.	.	7	1	.	.	10	1	.	.	.	.
Mimulus moschatus	.	.	.	.	.	.	10	1	.	.	.	.
Epilobium watsonii	.	.	7	4	.	.	10	1	.	.	.	.
Mentha arvensis	.	.	27	11	.	.	10	1	.	.	.	.
Galium triflorum	.	.	.	.	.	.	.	.	20	1	.	.
Taraxacum officinale	.	.	20	4	.	.	20	1	20	1	.	.
Potentilla gracilis	100	3	33	4	25	35	20	25	40	14	.	.
Trifolium longipes	.	.	13	3	25	2	10	2	40	24	.	.
Prunella vulgaris	.	.	13	2	.	.	10	3	20	1	.	.
Polygonum bistorioides	100	15	13	2	.	.	10	2	40	14	.	.
Aster modestus	.	.	7	1	.	.	10	1	40	5	.	.
Achillea millifolium	.	.	67	6	50	2	90	11	60	6	.	.
Senecio integerrimus	.	.	7	5	.	.	.	.	40	14	.	.
Sidalcea oregana	100	10	20	1	.	.	10	10	.	.	.	.
Camassia quamash	100	5	13	2	.	.	10	1	40	5	.	.
Iris missouriensis	100	25	13	1	.	.	10	10	.	.	.	.
Veratrum spp.	100	45	7	10	.	.	.	.	.	.	.	.
Lemna minor	.	.	.	.	.	.	.	.	.	.	100	5
Ranunculus aquatilis	.	.	.	.	.	.	.	.	.	.	100	20
Typha latifolia	.	.	.	.	.	.	.	.	.	.	100	80

PERENNIAL GRASSES												
Calamagrostis inexpansa	.	.	.	.	.	.	.	.	.	.	.	.
Muhlenbergia filiformis	.	.	7	10	.	.	.	.	.	.	.	.
Phleum alpinum	.	.	.	.	.	.	.	.	20	8	.	.
Deschampsia cespitosa	100	10	47	9	25	3	.	.	20	5	.	.
Agrostis scabra	.	.	7	5	.	.	10	5	.	.	.	.
Puccinellia pauciflora	.	.	.	.	.	.	.	.	.	.	.	.
Calamagrostis canadensis	.	.	7	4	.	.	10	2	.	.	.	.
Glyceria elata	.	.	20	2	.	.	20	7	20	7	.	.
Poa pratensis	.	.	87	15	25	3	90	25	20	8	.	.
Agrostis stolonifera	.	.	27	6	25	5	10	70	.	.	.	.
Trisetum wolfii	.	.	20	16	.	.	.	.	.	.	.	.
Stipa occidentalis	.	.	7	6	50	1	40	13	20	15	.	.
Phleum pratense	.	.	67	9	75	5	60	17	20	3	.	.
Festuca rubra	.	.	7	8	.	.	10	40	20	5	.	.
Alopecurus pratensis	.	.	.	.	.	.	10	18	100	59	.	.
Agrostis diegoensis	.	.	7	28	100	26	10	10	20	5	.	.
SEDGES AND RUSHES												
Carex scopulorum	.	.	.	.	.	.	.	.	.	.	.	.
Eleocharis pauciflora	.	.	7	40	.	.	.	.	.	.	.	.
Carex praegracilis	.	.	.	.	.	.	.	.	.	.	.	.
Carex luzulina	.	.	.	.	.	.	.	.	.	.	.	.
Carex muricata	.	.	.	.	.	.	.	.	.	.	.	.
Luzula campestris multiflora	.	.	7	15	.	.	.	.	20	6	.	.
Carex canescens	.	.	7	3	.	.	.	.	.	.	.	.
Carex jonesii	.	.	13	4	.	.	.	.	.	.	.	.
Carex cusickii	.	.	7	4	.	.	.	.	.	.	.	.
Carex aquatilis	.	.	33	3	.	.	10	10	.	.	.	.
Carex utriculata	.	.	7	2	.	.	.	.	.	.	.	.
Carex lasiocarpa	.	.	.	.	.	.	.	.	.	.	.	.
Carex sitchensis	.	.	.	.	.	.	.	.	.	.	.	.
Carex vesicaria vesicaria	.	.	.	.	.	.	.	.	.	.	.	.
Eleocharis bella	.	.	.	.	.	.	.	.	.	.	.	.
Carex lenticularis lenticularis	.	.	11	25	.	.	.	.	.	.	.	.
Carex stipata	100	55	.	.	.	.	.	.	.	.	.	.
Juncus ensifolius	.	.	56	4	25	1	10	2	40	3	.	.
Carex lanuginosa	.	.	100	50	.	.	.	.	.	.	.	.
Eleocharis palustris	50	1	11	10	.	.	.	.	20	20	.	.
Scirpus microcarpus	100	20	44	21	.	.	20	4	20	4	.	.
Carex simulata	.	.	.	.	.	.	.	.	.	.	.	.
Juncus balticus	.	.	44	16	50	20	40	6	.	.	.	.
Carex nebraskensis	.	.	22	7	.	.	10	17	.	.	.	.
Carex sheldonii	.	.	.	.	.	.	.	.	.	.	.	.
Juncus nevadensis	.	.	.	.	25	4	10	8	.	.	.	.
Juncus confusus	.	.	11	3	75	18	20	13	40	5	.	.
FERNS AND HORSETAILS												
Equisetum arvense	.	.	33	14	.	.	20	5	20	1	.	.

HERBACEOUS TYPES - SPRINGS AND STREAMS

	CAAM 12 Plots		SCMI 17 Plots		CALA 1 Plot		CANU4 2 Plots		PUPA 3 Plots		GLEL 10 Plots		CILA2 1 Plot	
SPECIES	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV	CON	COV
UNDERSTORY TREE LAYER														
Abies grandis	.	.	12	5	.	.	.	.	.	.	20	1	100	1
Picea engelmannii	.	.	12	1	.	.	.	.	.	.	30	3	.	.
TALL SHRUBS														
Alnus incana	25	7	18	2	100	3	.	.	.	.	20	3	.	.
Ribes hudsonianum	33	6	29	8	100	1	.	.	.	.	70	5	100	2
Alnus sinuata	.	.	.	.	.	.	.	.	.	.	10	1	100	8
Ribes lacustre	8	1	12	2	100	2	.	.	.	.	40	4	.	.
PERENNIAL FORBS														
Allium validum	.	.	.	.	100	17	.	.	.	.	.	.	.	.
Viola spp.	33	1	41	3	100	1	50	1	.	.	20	11	.	.
Prunella vulgaris	8	1	24	5	100	1	.	.	.	.	50	2	.	.
Habenaria dilitata	42	1	29	5	100	1	.	.	.	.	20	1	.	.
Mentha arvensis	25	4	18	9	.	.	100	5	.	.	40	3	.	.
Heracleum lanatum	8	7	6	4	100	15	.	.	.	.	30	2	100	2
Geum macrophyllum	42	2	59	7	100	2	.	.	.	.	70	2	100	Tr
Fragaria vesca	8	Tr	6	2	100	Tr	.	.	.	.	50	1	.	.
Aster modestus	.	.	24	2	100	4	.	.	.	.	40	3	.	.
Mimulus moschatus	25	2	29	3	.	.	.	.	.	.	60	2	.	.
Veronica americana	42	4	41	4	100	1	.	.	67	1	90	3	.	.
Galium triflorum	25	1	12	1	100	4	.	.	.	.	50	1	.	.
Achillea millifolium	17	1	47	4	100	Tr	.	.	.	.	20	1	.	.
Stellaria crispa	8	2	.	.	.	.	.	.	.	.	.	.	100	35
Streptopus amplexifolius	.	.	.	.	100	1	.	.	.	.	20	4	.	.
Epilobium glandulosum	58	4	35	1	100	1	50	6	67	8	70	1	100	30
Tiarella trifoliata unifoliata	.	.	.	.	100	1	.	.	.	.	20	15	100	40
Circaea alpina	17	3	6	Tr	.	.	.	.	.	.	60	2	100	3
Montia cordifolia	8	4	.	.	100	Tr	.	.	.	.	30	2	100	2
Mitella pentandra	8	1	.	.	100	1	.	.	.	.	30	7	100	5
Mimulus guttatus	58	4	35	2	.	.	.	.	33	80	60	2	.	.
Ranunculus uncinatus	.	.	18	1	100	1	.	.	.	.	20	1	.	.
Saxifraga arguta	.	.	12	3	100	2	.	.	.	.	40	6	100	5
Senecio triangularis	.	.	6	1	100	5	.	.	.	.	10	1	100	21
Rumex crispus	8	1	18	1	.	.	.	.	.	.	30	11	.	.
Thalictrum occidentale	.	.	.	.	.	.	.	.	.	.	20	1	.	.
Viola glabella	8	1	6	3	.	.	.	.	.	.	30	2	.	.
Trautvetteria caroliniensis	.	.	.	.	.	.	.	.	.	.	10	3	.	.
PERENNIAL GRASSES														
Poa pratensis	50	3	41	4	.	.	.	.	33	1	40	2	.	.
Agrostis stolonifera	17	2	12	5	.	.	50	16	33	5	10	1	.	.
Puccinellia pauciflora	.	.	24	4	.	.	.	.	100	67	10	1	.	.
Phleum pratense	8	1	18	4	.	.	.	.	.	.	20	21	.	.
Poa palustris	17	3	18	14	.	.	.	.	.	.	.	.	.	.
Glyceria elata	83	19	53	6	100	12	50	2	.	.	100	39	.	.
Cinna latifolia	8	15	.	.	100	1	.	.	.	.	40	4	100	15

Elymus glaucus	8	1	6	1	.	.	.	.	.	.	30	2	.	.
SEDGES AND RUSHES														
Carex amplifolia	100	58	18	8	.	.	.	.	.	.	20	4	.	.
Scirpus microcarpus	58	11	100	58	.	.	.	.	.	.	30	1	.	.
Carex laeviculmis	.	.	.	.	100	80	.	.	.	.	10	10	.	.
Carex nudata	.	.	.	.	.	.	100	92	.	.	.	.	.	.
Carex microptera	25	16	53	7	100	11	.	.	33	1	30	7	.	.
Juncus ensifolius	67	5	59	2	100	1	50	1	33	12	30	3	.	.
Juncus balticus	8	1	35	4	.	.	.	.	67	6	10	4	.	.
Carex lenticularis lenticularis	8	20	18	7	.	.	.	.	.	.	20	1	.	.
Carex jonesii	17	2	24	11	.	.	.	.	.	.	.	.	.	.
Luzula parviflora	.	.	.	.	100	1	.	.	.	.	10	1	.	.
Carex disperma	.	.	12	2	.	.	.	.	.	.	10	25	.	.
FERNS AND HORSETAILS														
Equisetum arvense	42	11	24	17	.	.	50	1	.	.	40	17	.	.
Gymnocarpium dryopteris	8	1	.	.	.	.	.	.	.	.	20	8	100	2
Athyrium filix-femina	8	10	.	.	.	.	.	.	.	.	40	24	100	9
Adiantum pedatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.

SPECIES	EQAR 5 Plots CON	COV	SETR 3 Plots CON	COV	VEAM 5 Plots CON	COV	ADPE 2 Plots CON	COV	SAAR4 3 Plots CON	COV
UNDERSTORY TREE LAYER										
Abies grandis	.	.	.	.	.	.	50	Tr	.	.
Picea engelmannii	.	.	67	4	.	.	50	1	33	1
TALL SHRUBS										
Alnus incana	.	.	.	.	.	.	.	.	.	.
Ribes hudsonianum	20	2	67	6	40	8	.	.	.	.
Alnus sinuata	.	.	33	5	.	.	.	.	.	.
Ribes lacustre	.	.	100	2	40	6	100	2	100	1
PERENNIAL FORBS										
Allium validum	.	.	.	.	.	.	.	.	.	.
Viola spp.	20	1	33	1	.	.	.	.	.	.
Prunella vulgaris	20	1	.	.	.	.	.	.	.	.
Habenaria dilitata	.	.	33	1	.	.	.	.	33	1
Mentha arvensis	60	15	.	.	.	.	.	.	.	.
Heracleum lanatum	.	.	33	3	.	.	.	.	.	.
Geum macrophyllum	.	.	100	1	40	1	.	.	33	1
Fragaria vesca	.	.	33	1	20	1	.	.	33	1
Aster modestus	20	1	.	.	.	.	.	.	67	1
Mimulus moschatus	20	3	.	.	60	8	.	.	.	.
Veronica americana	40	2	67	3	100	39	.	.	33	3
Galium triflorum	.	.	100	1	20	1	50	1	.	.
Achillea millifolium	.	.	67	1	20	1	50	1	33	1
Stellaria crispa	.	.	.	.	.	.	.	.	.	.
Streptopus amplexifolius	.	.	33	8	20	1	50	2	.	.
Epilobium glandulosum	60	1	67	3	40	9	100	2	67	4
Tiarella trifoliata unifoliata	.	.	67	2	.	.	50	2	.	.
Circaea alpina	.	.	67	1	20	4	.	.	.	.
Montia cordifolia	.	.	67	2	.	.	50	1	33	9
Mitella pentandra	.	.	67	1	20	30	.	.	67	10
Mimulus guttatus	60	5	67	2	80	12	.	.	67	1
Ranunculus uncinatus	.	.	100	2	40	1	.	.	67	1
Saxifraga arguta	.	.	67	4	40	18	.	.	100	37
Senecio triangularis	20	1	100	50	.	.	.	.	100	2
Rumex crispus	40	40	.	.	20	1	50	Tr	.	.
Thalictrum occidentale	.	.	100	2	.	.	.	.	.	.
Viola glabella	20	1	67	1	20	2	50	1	.	.
Trautvettaria caroliniensis	.	.	67	22	.	.	.	.	.	.
PERENNIAL GRASSES										
Poa pratensis	.	.	.	.	.	.	.	.	.	.
Agrostis stolonifera	20	3	.	.	.	.	.	.	.	.
Puccinellia pauciflora	20	1	.	.	.	.	.	.	.	.
Phleum pratense	40	1	.	.	.	.	.	.	.	.
Poa palustris	.	.	.	.	40	23	.	.	.	.
Glyceria elata	80	5	100	4	80	6	50	2	33	6
Cinna latifolia	.	.	33	2	40	4	50	1	33	3
Elymus glaucus	.	.	.	.	20	1	50	60	.	.

SEDGES AND RUSHES										
Carex amplifolia	20	5	.	.	.	.	.	.	.	.
Scirpus microcarpus	20	1	.	.	.	.	.	.	.	.
Carex laeviculmis	.	.	.	.	.	.	.	.	.	.
Carex nudata	.	.	.	.	.	.	.	.	.	.
Carex microptera	20	1	.	.	20	1	.	.	33	2
Juncus ensifolius	40	1	.	.	20	1	.	.	67	1
Juncus balticus	20	1	.	.	20	1	.	.	.	.
Carex lenticularis lenticularis	40	2	.	.	.	.	.	.	.	.
Carex jonesii	.	.	.	.	.	.	.	.	33	1
Luzula parviflora	.	.	.	.	.	.	.	.	67	2
Carex disperma	.	.	67	10	20	2	.	.	33	1
FERNS AND HORSETAILS										
Equisetum arvense	100	49	33	1	.	.	.	.	.	.
Gymnocarpium dryopteris	.	.	33	30	.	.	.	.	.	.
Athyrium filix-femina	.	.	.	.	.	.	50	25	.	.
Adiantum pedatum	.	.	.	.	.	.	100	28	.	.