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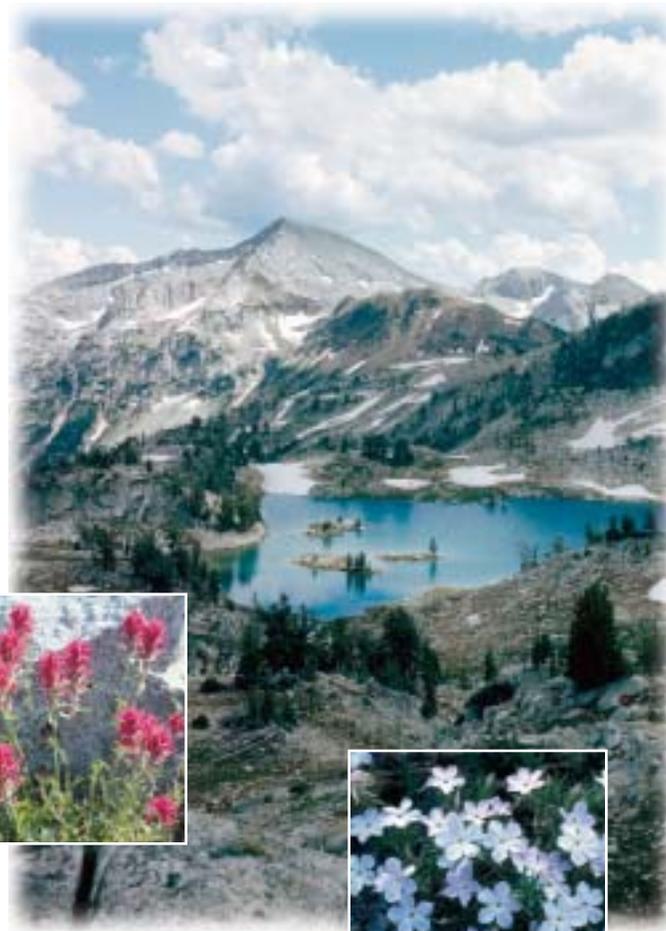
Forest
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Pacific
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Alpine and Subalpine Vegetation of the Wallowa, Seven Devils and Blue Mountains

By Charles Grier Johnson Jr.



Alpine and Subalpine Vegetation of the Wallowa, Seven Devils, and Blue Mountains

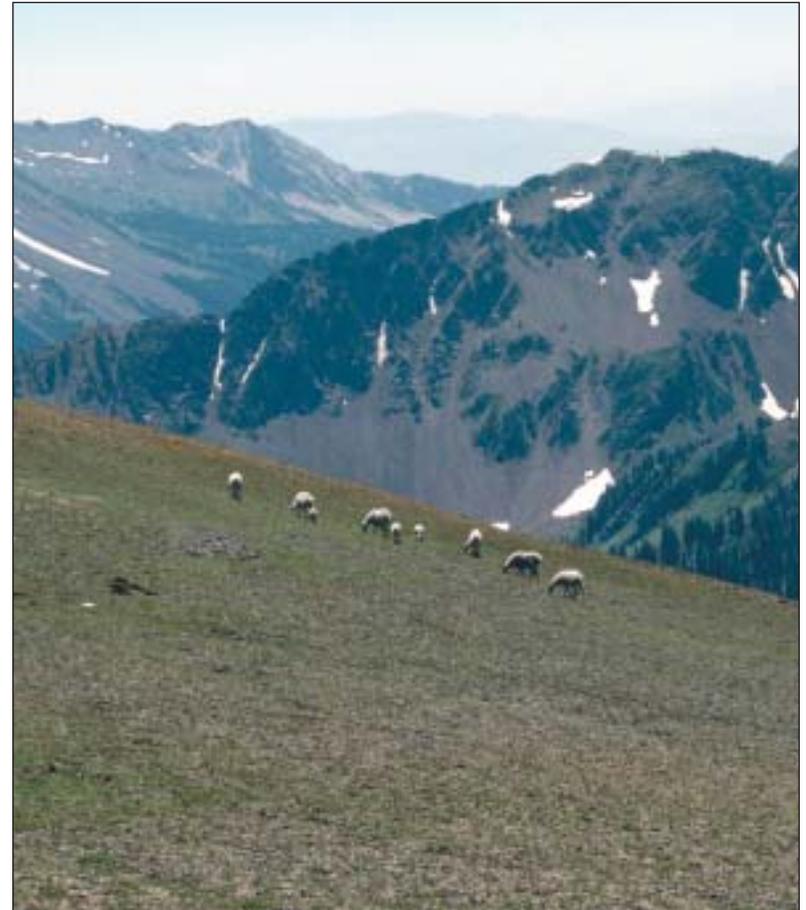
Charles G. Johnson, Jr.

PHOTOS:

Front Cover: Glacier Lake and Cusick Mountain
in the Wallowa Mountains.

Title Page: Grazing mountain goats on the summit
of Cusick Mountain, Wallowa Mountains.

Back Cover: Subalpine fir nursed by a whitebark
pine snag.



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To My Packers

Access to remote subalpine portions of the mountains often required special assistance from packers for the equipment, gear, and supplies necessary for 8 to 10-day hitches. Although the majority of the plots were established far and high above base camps, these experienced packers also pitched-in to scribe the data, dig a soil pit, or jiffy-up a tasty meal. For all the long trail miles and pleasant times in magnificent landscapes, I'm deeply indebted to these dedicated individuals.



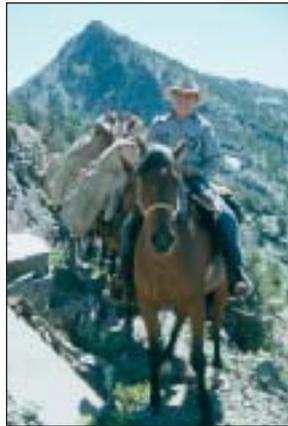
Fred Talbot
1977
Wallowa Mountains



Wayne
Burlison
1983
Seven
Devils
Mountains



Pete Schreder
1992-1994
Wallowa Mountains
Strawberry Mountains



Patty Shinn
1995
Elkhorn
Mountains



Cathy Conover
1997
Seven Devils
Mountains



Howard Lyman
1996-1998-1999
Wallowa Mountains



Max Mallory
2000
Wallowa Mountains

Field Assistants

Over the years there have been many who have assisted me with access into remote subalpine portions of the mountains enabling me to conduct field studies. Others have accompanied me to assist with sampling of vegetation and soils. To all of these individuals, I owe a great belated "thank you."

Wallowa Mountains

Fred Talbot, Margaret Connelly, Rick Miller, Steven Simon, Mary Brodahl, Bob Sheehy, Tom Dechert, Jim Barrett, Art Kreger, Jerry Hernandez, Pete Schreder, Howard Lyman, Jerry Hustafa, Max Mallory, and Carolyn McCormack.

Seven Devils Mountains

Red Woods, Wayne Burlison, Angelica Johnson, Frank Conley, and Cathy Conover.

Elkhorn Mountains

Patty Shinn.

Greenhorn Mountains

Melica Johnson.

Strawberry/Aldrich Mountains

Pete Schreder, Mark Penninger, and Gene Yates.

Office Assistants

Each year data collected were entered into electronic databases and computer runs made to assist in classifying the vegetation into types. Finally, after writing the findings, words and images were placed into a document for the printing of this publication. My gratitude is given to the following people that assisted me in these endeavors.

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Line Drawings:

The pen and ink drawings of plant parts have been used by permission of the University of Washington Press (Seattle, Washington) and were copied from "Vascular Plants of the Pacific Northwest" (Volumes 1-5) by C.L. Hitchcock, A. Cronquist, M. Ownbey, and J.W. Thompson.

I began my journey into the alpine wonderlands of the inland Pacific Northwest about the time this photo was taken in 1964. My initial goal was to climb the twenty highest peaks of the Wallowa Mountains and learn some plants along the way. Over the ensuing years I continued climbing to the summits of many mountains and spent quality time with the subalpine and alpine flora.

In 1964, another Johnson (Lyndon Baines) signed the Wilderness Act in Washington, D.C. and the Eagle Cap Wilderness was created. I became one of the first wilderness guards in the new Eagle Cap Wilderness. As the Lakes Basin Guard, the subalpine forests, alpine ridges, and soaring peaks were my "office." I continued to climb, but my interests were shifting to the flora. I was inquisitive. I spent my nights keying unknown plants by lantern light at my Douglas Lake camp.

A two-year sabbatical from northeast Oregon began in 1967, when I went to Chile with the Peace Corps. This experience heightened my interest in subalpine vegetation, when my culminating year was spent studying, mapping, and documenting the subalpine plant communities in the high southern Andes Mountains. This would propel me to graduate studies at the University of Idaho where plant ecology would be my focus.

In 1972, I became familiar with another northeast Oregon wilderness area as a member of the Strawberry Mountain Wilderness trail crew. This experience provided me with more opportunities to learn new subalpine plants and begin an understanding of the plant communities in which they occurred. My goals were now changing from mountain climbing and floral identification, to a desire to differentiate the various plant communities, and to better understand the elements influencing where a particular plant grows and establishes its residency.

In 1977, following advanced studies in plant ecology at Oregon State University, I became the first plant ecologist for the Malheur, Umatilla, and Wallowa-Whitman National Forests.

In 1980, as part of the Forest Service "potential plant community classification effort for Washington and Oregon," I began systematically sampling the subalpine and alpine ecosystems of the Wallowa, Seven Devils, and Blue Mountains.

This book culminates my multi-year effort to seek, learn, document, and analyze the alpine and subalpine plant community information gathered from many trips into the high mountains. Hopefully the information contained in the following pages will assist managers in maintaining and enhancing these fragile ecosystems, and help visitors using this book better understand and appreciate the magnificent diversity of plants and plant communities that exist in these high altitude landscapes.

Charles G. Johnson Jr., PhD
Baker City, Oregon



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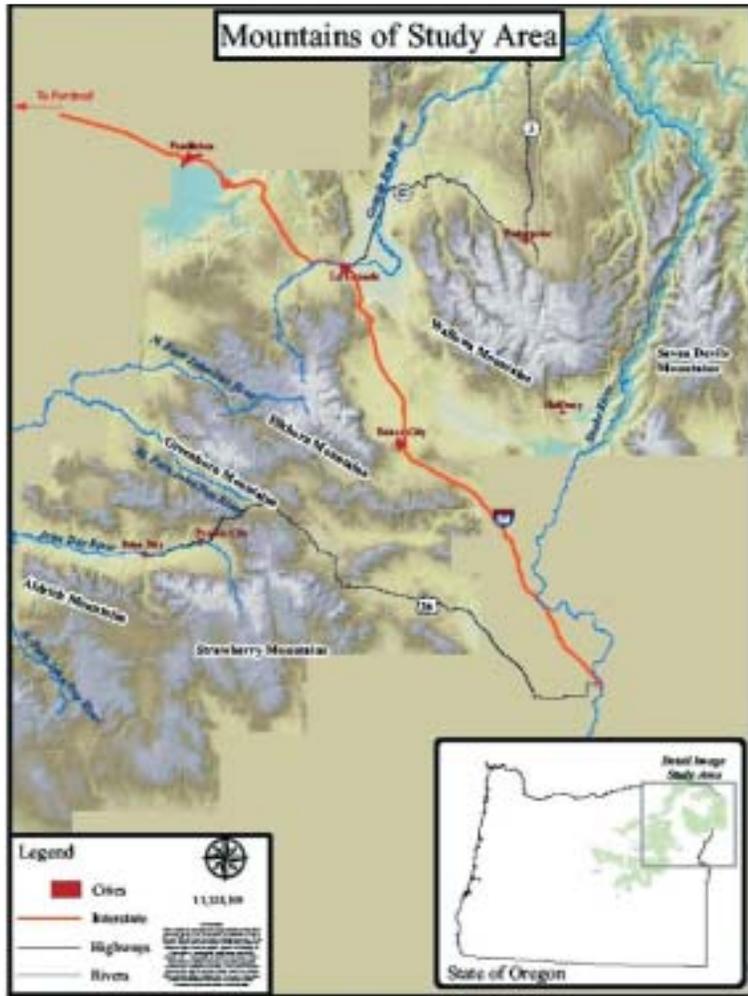
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Introduction

The vegetation of high elevations in the mountains of northeast Oregon and adjacent Idaho has been previously described. In 1987 some of the higher elevation plant communities of the Wallowa and Seven Devils Mountains were included in the classification and management guide *Plant Associations of the Wallowa-Snake Province* (Johnson and Simon 1987). The higher elevation vegetation of the Blue Mountains was incorporated in the classification and management guide *Plant Associations of the Blue and Ochoco Mountains* (Johnson and Clausnitzer 1992).

The remote topography, difficult accessibility, and high variation in types of vegetation and plant communities limited the information and data available for those publications. In 1993, and continuing through 2002, an effort was made to bolster the number of plots providing data about subalpine and alpine vegetation and to visit a greater representation of high-elevation landscapes to provide better information for land managers, specialists, scientists, and recreationists. In all, 582 permanent plots have been installed for the purposes of this study and are now available for documenting change in the future.

The objectives of this study were to complete the upland classification of vegetation for subalpine and alpine environments, provide a guide for managers to use in determining vegetation types and their potential based on environmental factors, and establish a scientific basis for restoration activities based on probable successional pathways. This study did not include riparian and wetland vegetation. The high-elevation wetlands of these mountains will be included in a subsequent publication.



The principal locations used in the study were the Wallowa, Elkhorn, Greenhorn, Strawberry, and Aldrich Mountains in northeastern Oregon and the Seven Devils Mountains in adjacent Idaho.

Locations of the Study

Wallowa Mountains - This mountainous uplift encompasses an area of 30 by 60 miles and has the greatest extent of subalpine and alpine environments within the study area. These mountains are located primarily in Wallowa County; the southern flank in northern Baker County; and the western flank in eastern Union County of northeast Oregon. A large portion of the Wallowa Mountains are administered by the Wallowa-Whitman National Forest with almost 300,000 acres included in the Eagle Cap Wilderness. Relief is approximately 5,000 ft from Chief Joseph Mountain to Wallowa Valley. The uplift is characterized by granitic, limestone-marble, and volcanic rock, which is surrounded by lower mountainous ridges of Columbia River basaltic rock. Prominent peaks are above 9,200 ft elevation with the highest represented by Mt. Sacajawea (9,838 ft), The Matterhorn (9,826 ft), Point Joseph (9,616 ft), and Red Mountain (9,555 ft).



The Matterhorn from Eagle Cap

Seven Devils Mountains - The "Devils" are on the opposite side of Hells Canyon from the Wallows in Idaho. This narrow, serrated range of subalpine peaks occurs in western Idaho and Adams Counties and provides the "wall" that is measured above the Snake River Canyon breaks that provides the relief making Hells Canyon of the Snake River the deepest gorge in North America. It is almost 8,000 ft from the top of He Devil Peak to the depths of the Snake River below (Orr et al. 1992). The Devils are in the Nez Perce and Payette National Forests and are administered as part of Hells Canyon National Recreation Area. These mountains are dominated by Triassic metabasalts of the Wild Sheep Formation (Vallier 1974). He Devil (the highest at 9,400 ft), She Devil, The Ogre, and Tower of Babel are the principal high peaks of the uplift.



Seven Devils Peaks from Heavens Gate

Elkhorn Mountains - The "Elkhorns" are in the central Blue Mountains in northeast Oregon. They occupy the western portion of Baker County. Relief is approximately 5,000 ft above Baker Valley. The Elkhorns are administered by the Wallowa-Whitman National Forest. The axis of the range runs northwest to southeast. The northern Elkhorns are granitic, whereas argillites comprise the southern portion of the mountains. Rock Creek Butte (9,106 ft) and Elkhorn Peak (8,931 ft) are prominent high peaks.



View north from Elkhorn Peak

Greenhorn Mountains - The Greenhorns are located in the south-central Blue Mountains in northern Grant County, Oregon. The range trends east-west and is approximately 8 miles long. The mountains are the divide between the Malheur and Umatilla National Forests. The Vinegar Hill-Indian Rock Scenic Area is administered by the Malheur National Forest. The mountains are comprised of basaltic and granitic rocks. Prominent peaks are Vinegar Hill (8,100 ft), Boulder Butte, Squaw Rock, and Indian Rock.



View west to Ben Harrison Peak from Vinegar Hill

Strawberry Mountains - This is the highest range in the southern Blue Mountains. It trends northwest to southeast for approximately 18 miles and rises approximately 4,000 ft above the John Day River Valley. The mountains are within the Malheur National Forest in Grant County, Oregon. The Strawberry Mountain Wilderness Area comprises almost 69,000 acres and wholly contains the subalpine and alpine portions of the range. The range is comprised principally of Miocene basaltic and rhyolitic flows, breccias, and tuffs of the Strawberry Volcanics (McKee 1972). The prominent peaks are Strawberry Mountain (highest at 9,038 ft), Graham Mountain, and Canyon Mountain.



Strawberry Mountain from Baldy Mountain

Aldrich Mountains - This mountain range is located in the southern Blue Mountains to the west of the Strawberry Mountains. It trends west to east for over 24 miles and forms the southern side of the John Day River Valley between Mt. Vernon and Dayville in Grant County, Oregon. Mountains in this range rise approximately 4,500 ft above the John Day River and are contained within the Malheur National Forest. The large Fields Creek Formation provides Triassic graywacke and andesites for much of the range. The peaks of the range barely rise into the subalpine environment with the highest at slightly over 7,000 ft. Prominent peaks are Fields Peak (7,362 ft), Aldrich Mountain (6,987 ft), Moon Mountain, and McClellan Mountain.



Fields Peak and McClellan Mountain from Ingle Mountain

Alpine and Subalpine - Defined



Subalpine fir Krummholz, Hurricane Divide, Wallowa Mountains

The climate-induced differentiation of vegetation at the forest line separates alpine and subalpine zones. The alpine zone occurs above the natural high-altitude forest line. Forest line differentiates subalpine forests from the herb-dominated vegetation of the alpine zone, which can have scattered trees or shrubs (Sawyer and Keeler-Wolf 1995). It is where tundra occurs in more northern latitudes. In the mountains of this study area, alpine vegetation is characterized by fellfields, turf communities, rocky ridgetops, and scree communities. The alpine zone generally begins above 9,000 ft elevation in the study area.

The subalpine zone occurs above 7,500 ft in the Wallowa and Elkhorn Mountains above 7,000 ft in the Seven Devils and Greenhorn Mountains; and is lowest in elevation in the Strawberry Mountains at 6,500 ft. The subalpine zone is characterized by a distinctive vegetation, usually forest, that occurs elevationally below the alpine zone. At the alpine/subalpine ecotone, subalpine fir and whitebark pine Krummholz occur. The tree growth is dense, often prostrate, and of a shrubby habit owing to wind and ice shearing at high altitudes (Zwiger 1972). The lower portion of the subalpine forest is where subalpine fir forests thrive. Here, whitebark pine, subalpine fir, and subalpine Douglas-fir forests are found immediately above the mid-montane forests often dominated by grand fir. Grand fir and Douglas-fir plant associations occurring below the subalpine zone (below 7,000 ft) at high elevations have been included in this study. Grand fir and Douglas-fir occurring at high elevation are portrayed instead of the entire range for those forest types.

Vegetation

Overview

Climatic regime, elevation, aspect, soils, geology, and disturbances all influence vegetation. Vegetation zones are oriented by temperature and moisture similarities as dictated by location relative to elevation, aspect, and soils. In the subalpine environments, potential vegetation is predictable based on a knowledge of indicator plant species and position on the landscape. For example, warmer temperatures and lower precipitation will promote Douglas-fir on forested sites, whereas subalpine fir requires colder temperatures and higher precipitation at the same elevation in the subalpine. Similarly, Idaho fescue can persist on drier sites and shallow soils, whereas green fescue requires deeper soils and greater moisture holding capacity from soils in the subalpine terrain. Each of the six mountain ranges containing subalpine and alpine vegetation in northeastern Oregon and adjacent Idaho have common vegetation as well as vegetation unique to a particular geologic substrate or climatic regime.

Vegetation of the Wallowa Mountains



Little Eagle Meadows and southern Wallowa Mountains

Ascending through forested vegetation, ponderosa pine and Douglas-fir are generally part of the mid-montane forests. Douglas-fir/pinegrass communities can be found below 7,000 ft at the lower limits of the subalpine zone. Similarly, grand fir/pinegrass communities reach their elevational extent at just under 7,000 ft elevation. The first forested series that is encountered as a firm member of the subalpine forest is subalpine fir. It interfingers to lower elevations along stream courses but has its upland zone between 6,000 and 8,000 ft elevation.

Subalpine fir/grouse huckleberry is the benchmark type for the series and probably occupies the greatest number of acres of all subalpine fir plant associations. Subalpine fir-Engelmann spruce/Labrador tea is unique to the Wallowa Mountains. At the upper limits of the zone, subalpine fir mixes with whitebark pine and is often codominate. These communities are encountered as low as 7,500 ft in elevation and may be found above 8,500 ft elevation. The last forest encountered before the limits of tree growth is comprised of whitebark pine. Here environmental conditions are too severe (cold, dry) for subalpine fir establishment. Whitebark pine plant associations range from 8,000 to 9,000 ft in the Wallowas. Limber pine and mountain hemlock communities occur in the Wallowa Mountains and are found between 6,000 to 7,000 ft on specialized habitats.

Subalpine grasslands are dominated by green fescue in the Wallowa Mountains. They occur on deep soils between 6,000 and 8,500 ft. Idaho fescue reaches its altitude limit (8,500 ft) along with green fescue but occupies drier sites on shallower soils. The false tundra of the alpine zone in the Wallowas is occupied by fellfields, turf, and scree communities. Fellfields occupy the upper slope and ridgetop locations above tree line and culminate with rock outcrop communities of the peaks and ridge crests. Turf communities averaged slightly lower in elevation (8,900 ft versus 9,200 ft for fellfields).

Vegetation of the Seven Devils Mountains



Seven Devils from Two Corral Creek, Hells Canyon National Recreation Area

Ascending through forests in the Seven Devils Mountains, the mid-montane forests of Douglas-fir and grand fir usually reach their elevational limit at 6,000 ft (Douglas-fir was found at 6,000 ft at McGaffe Saddle). Grand fir/big huckleberry plant communities were found at 6,000 ft. Similar to the Wallawas, subalpine fir forests dominate the subalpine zone in the Seven Devils Mountains. Subalpine fir associations with big huckleberry and grouse huckleberry were dominant. Subalpine fir/beargrass plant communities were unique to the Seven Devils in this study area. The subalpine fir/Engelmann spruce/fool's huckleberry plant association was unique to the Seven Devils as well. The subalpine fir zone in the Seven Devils is similar to that of the Wallowa Mountains (6,000 to 8,000 ft). At the upper limits of the subalpine fir zone the species is often codominant with whitebark pine and associated with grouse huckleberry. Occurring from 8,000 to 8,500 ft the whitebark pine/grouse huckleberry/smooth woodrush plant association represented the benchmark type for the Seven Devils. It was only found in the Seven Devils.

No green fescue was found in the Seven Devils. The most frequent grassland contains Idaho fescue. Two types found only in the Seven Devils were Idaho fescue-timber oatgrass-sedge and Idaho fescue-Hood's sedge ranging from 7,200 to 8,000 ft. Subalpine shrublands were dominated by mountain big sagebrush. Fellfields and turf communities were rarely found and were usually small in extent along the craggy peaks and ridgetop outcroppings of the Seven Devils.

Vegetation of the Elkhorn Mountains



Elkhorn Mountains

The forests of the subalpine zone were either dominated by subalpine fir or whitebark pine. Lodgepole pine was an important early seral stage associate. The principal plant association in the subalpine fir zone (6,000 to 8,000 ft) is subalpine fir/grouse huckleberry. The subalpine fir - Engelmann spruce/white rhododendron community was unique to the Elkhorns in the study area. Subalpine fir and whitebark pine often codominated above 7,500 ft where they were associated with mountain gooseberry, skunk-leaved polemonium, and grouse huckleberry. The whitebark pine zone (8,000 to 9,000 ft) was characterized by the same associates (mountain gooseberry, skunk-leaved polemonium, grouse huckleberry) as occur in subalpine fir-whitebark pine forests. At the higher elevation, whitebark pine/elk sedge and whitebark pine/prickly sandwort communities were found on cold, dry sites.

Grasslands, fellfields, and turf communities were not found in the subalpine zone of the Elkhorns. Dominating open nonforested portions of the landscape were communities dominated by mountain big sagebrush. Mountain big sagebrush/elk sedge communities were prevalent between 7,500 and 8,200 ft elevation. These reflect the change in climates from the temperate oceanic regime, influencing the Wallawas to the north, and the temperate continental regime emanating from the southern Great Basin.

Vegetation of the Greenhorn Mountains



View west to Squaw Rock from Boulder Butte

The Greenhorn Mountains are similar to the Elkhorn Mountains of the central Blue Mountains. Douglas-fir and grand fir forests are mid montane. Subalpine fir forests are elevationally above grand fir in the subalpine zone, which ranges from 7,000 to 8,000 ft elevation for the subalpine fir series. At the upper elevational limits of subalpine fir, whitebark pine is associated with elk sedge.

Whitebark pine is poorly represented in the Greenhorns where subalpine ridges average under 8,000 ft. Mountain big sagebrush communities dominate the summits with interspersed forbfields (a result of overgrazing). Mountain big sagebrush/elk sedge communities are prevalent. The changes in climatic regime from the temperate oceanic to the temperate continental are reflected in the prevalence and abundance of elk sedge found in Greenhorn Mountain plant communities.

Vegetation of the Strawberry Mountains



Strawberry Mountains, Upper John Day River Valley

Douglas-fir is found at higher elevations in the Strawberry Mountains than in the Wallows, Seven Devils, or Elkhorn Mountains to the north owing to the influence of drier, warmer temperate continental climate. Where Douglas-fir reached its elevational limit at 6,000 ft in the northern mountains, here Douglas-fir plant associations occur to 7500 ft. A benchmark subalpine Douglas-fir plant association found here is Douglas-fir/pinemat manzanita/elk sedge. The grand fir zone is weakly represented in the subalpine of the Strawberries. Subalpine fir is also less prominent here in the southern Blue Mountains. The subalpine fir zone ranges from 6,500 to 8,000 ft elevation with the dry, cold subalpine fir/grouse huckleberry plant association the most common of the subalpine fir plant associations. The whitebark pine zone extends from 8,000 - 9,000 ft elevation. Here dry, cold site communities occur where key associated vegetation is skunk-leaved polemonium, elk sedge, and prickly sandwort. Shrublands are extensive with mountain big sagebrush/elk sedge and mountain-mahogany/Idaho fescue-bluebunch wheatgrass communities dominating the nonforested landscapes. Grasslands occur on warm, dry sites in the subalpine where Idaho fescue and bluebunch wheatgrass codominate. A plant association found on ultramafic (serpentine) sites, endemic to the Strawberry Mountains, is Idaho fescue-bluebunch wheatgrass/Cusick's fraseria.

Vegetation of the Aldrich Mountains



McClellan Mountain

As in the Strawberry Mountains to the east, the first series encountered on ascending to the subalpine zone is Douglas-fir. Similar to Douglas-fir in the Strawberry Mountains, Douglas-fir communities top out at 7,000 ft. Grand fir is not represented in the subalpine here. Above Douglas-fir is subalpine fir in the zonal sequence. However, it, like grand fir, is essentially absent. At the 7,000-foot elevation, subalpine fir/heartleaf arnica was documented as the lone example for the series in the dry, warm Aldrich Mountains. Whitebark pine does not occur in the Aldrich Mountains. Shrublands dominate the subalpine ridges and summits. Mountain mahogany and mountain big sagebrush blankets large expanses. Of special note are the endemic communities of low sagebrush with Idaho fescue and bluebunch wheatgrass present to 9,200 ft elevation. This plant association is much more prevalent at mid-montane and desert locations to the south of the Aldrich Mountains. Idaho fescue-bluebunch wheatgrass communities are prominent where soil depths are insufficient for sagebrush establishment.

Physiology

Overview

The subalpine and alpine summits are parts of mountain ranges having multiple origins, various orientations, and relief (Orr et al.1992). The Wallowas are a 60 by 30-mile heart-shaped uplift adjacent to the north-south trending linear range of the Seven Devils. The Wallowa Mountains contain the largest expanse of subalpine and alpine environments of the mountains in Oregon and in this study. The Blue Mountains trend from northeast to southwest and contain the Elkhorn, Greenhorn, Strawberry, and Aldrich Ranges. The Greenhorn and Elkhorn Mountains trend northwest to southeast. The Strawberry and Aldrich Mountains form an east-west trending linear range in the southern Blue Mountains.

The alpine and subalpine terrain provides the start of major watersheds draining from these mountains. The Imnaha, Wallowa, and Minam Rivers all flow from beginnings in the Wallowa Mountains. The Grande Ronde and Powder Rivers initiate in the Elkhorn Mountains. The John Day and Malheur Rivers originate from the Strawberry and Aldrich Mountains.

Geology

The Wallowa Mountains

The oldest rocks pertain to the Clover Creek Formation of the late Paleozoic Era (Permian to lower Triassic Periods: 225 to 270 million years ago). Exposures of this andesitic core occurred when the mountains were uplifted during the Mesozoic Era (Orr et al. 1992). Greenstones pertaining to this formation are exposed along the West Fork Wallowa River north of Lake Creek, along the Middle Fork Imnaha River, and below Norway Basin.

Stratigraphically above the Clover Creek Formation are the limestones and marbles of the Martin Bridge Formation. These rocks were formed in the upper Triassic Period (220 million years ago) during the Mesozoic Era. The formation consists of mostly fossiliferous limestones. Where there has been deformation, limestone was metamorphosed into white marble. This formation is magnificently exposed on the west face of the Matterhorn as it rises majestically for 3,000 ft above Hurricane Creek. Marble Mountain provides another dramatic exposure of this formation along the upper main fork of the Imnaha River.



Martin Bridge Formation (banded limestone) - Middle Fork-South Fork Ridge, Middle Fork Imnaha River



Limestone of Martin Bridge Formation - summit of the Matterhorn

The Hurwal Formation lies above the Clover Creek Formation stratigraphically. The metamorphosed darkened shales of this formation were formed in the late Triassic to early Jurassic Periods (190 million years ago). Hurwal Divide provides its name to the formation and is the type locality. This ridge, containing five peaks above 9,000 ft, is comprised of the slate along the ridge crest. Sentinel Peak, another prominent peak of the northern Wallowas, tops the divide between the West Fork of the Wallowa River and the North Fork of the Imnaha River. It, and the associated ridge, prominently display the reddish slates of the Hurwal Formation.



Hurwal Formation, Hurwal Divide

In the late Jurassic and early Cretaceous Periods, the Wallowa Batholith was formed about 160 million years ago (Pohs 2000). This huge mass formed the "core" of the Wallowa Mountains. At 324 square miles in extent, it is the largest in Oregon (Orr et al. 1992). The crystalline igneous rocks are principally granodiorite. Rocks of this formation provide the most dominant exposures in the heart of the Wallowas. Many of the subalpine cirques are carved from the granitic rock of the Wallowa Batholith. Good examples of exposed granodiorites are found in the southern Wallowas (Traverse and Echo Lake cirques; Krag Peak and Granite Mountain).



Basalt dikes in Wallowa Batholith granodiorite, Eagle Cap

The Cenozoic Era (65 million years ago to present) provided widespread volcanism during the Miocene Era of the Tertiary Period (17 to 6 million years ago)-McKee 1972. About 17 to 12 million years ago, much of northeastern Oregon was covered with Columbia River basalt flows. Molten lava poured forth from many fissures that simultaneously erupted. Lavas pooled as much as 200 ft in thickness, whereas most flows formed 50 to 100 ft in thickness. When the Wallowa Mountains uplifted, the overlying basalt was transported to cap many of the higher peaks. Chief Joseph Mountain has a relict flat-topped summit of basalt. Peaks on the perimeter of the northern Wallowas are especially notable for their summits or "caps" of Columbia River basalt (i.e., Mount Aneroid on the east, Ruby Peak and Chief Joseph Mountain on the north, and China Cap and High Hat Peak on the west). Feeder dikes (conduits for the lavas) are strikingly visible on the exposed granodiorite rock faces of the Wallowa Batholith (i.e., Eagle Cap) and running through the limestones of the Martin Bridge Formation (i.e., Matterhorn, Middle Fork of the Imnaha Divide).



Columbia River basalt flows, East Fork Pine Creek Canyon

The Pleistocene Epoch (2 million to 10,000 years ago) provided glaciation and concurrent sculpting of the major drainages in the Wallowas. It is estimated that the Wallowas were glaciated at least three times, and perhaps as many as seven times, between 500,000 and 11,000 years ago (Crandell 1965). Estimates are that ice advances and retreats lasted approximately 150 to 200 thousand years each (Orr et al.1992). Nine large glaciers, each more than 10 miles long, averaged 1,000 ft in thickness and covered approximately 280 square miles. Because they did not occur above 8,500 ft, the Wallowas have never had an ice cap. An example of one glaciated canyon is the West Fork of the Wallowa River Canyon.

The Benson Glacier scoured the West Fork for almost 20 miles, was 2,000 ft thick, and left what is considered to be the most perfect lateral moraine in the United States enclosing Wallowa Lake on the east side. The relict perpetual snowbank residing above Glacier Lake on the north slope of Glacier Peak is all that remains of the Benson Glacier today.



Glaciated Hurricane Creek Canyon and The Matterhorn



Glacially-polished table, Douglas Lake basin

The eruptions of Glacier Peak in the North Cascades 12,000 years ago and Mt. Mazama in the southern Oregon Cascade Mountains (6,600 years ago) provided ash deposits across the eastern Oregon landscape. The forest communities growing on soils containing ash deposits are the most productive in the subalpine of the Wallowas.

The Seven Devils Mountains

The subalpine and alpine peaks of the Seven Devils contain volcanoclastic rocks, limestone, graywacke, and argillite pertaining to the Wild Sheep Creek Formation. These rocks were erupted from basaltic islands and seamounts in the mid to late Triassic Period of the Mesozoic Era (Vallier 1998). These "metavolcanics" constitute a mass that is more than 3,000 ft thick in the Seven Devils.

The Miocene Epoch of the Tertiary Period brought the eruptions of Columbia River basalt that cap portions of the Seven Devils. The period lasted only about 2 million years in the interval of 17 to 14 million years ago (Vallier 1998). Between the eruptions there were long sedentary periods when soils developed and vegetation and animals established, evolved, and died between the eruptions. The red color bands between flows attest to the heat that baked the soils and the ashes of the plant and animal communities. Over the past 6 million years, the uplift of the mountainous mass carried the flow basalts over 6,000 ft to reside today above 9,000 ft in elevation in subalpine terrain.

The Blue Mountains

Elkhorn Mountains - This linear north-south trending range of mountains is bisected by the rock formations pertaining to two terranes. The southern half of the mountains consist of argillitic rock of the Baker terrane (Orr et al. 1992). The argillite was formed from metamorphosed mud and chert originally deposited in deep ocean environments. The northern half of the Elkhorns consist of intrusive rocks pertaining to the Anthony Lake Granodiorite Formation (Taubeneck 1957) of the Bald Mountain Batholith. This mass of granitic rock extends for over 144 square miles (Orr et al. 1992). Columbia River Basalts are not part of the subalpine terrain of the Elkhorns. The Pleistocene Ice Age (2 million to 11,000 years ago) sculpted the cirques and U-shaped valleys prominent in the subalpine of the Elkhorns.

Greenhorn Mountains - The northwest-southeast trending subalpine ridge of the Greenhorns has three distinct geologic formations. Anchoring the southeast end of the subalpine summit is Vinegar Hill. This portion of the Greenhorns contains greenstones from the Paleozoic with serpentized lenses. The middle portion, dominated by Boulder Butte, contains granodiorite and tonalite from the Anthony Lake Granodiorite Formation (Taubeneck 1957). The northwest end of the subalpine summit is dominated by Indian Rock and Squaw Butte. Here andesites and olivine basalts occur as parts of the Miocene Columbia River Basalts. Alpine glaciation occurred in the Greenhorns during the Pleistocene.

Strawberry Mountains - The Izee Terrane, representing a shallow marine basin once located between a volcanic island and the oceanic trench, underlies part of this east-west trending mountainous range. Another portion, known as the Canyon Mountain complex, is part of the Baker Terrane (Orr et al. 1992). This complex of rocks contains an abundance of metamorphosed serpentine from the Permian Period (250 million years ago). Also in this complex are argillites, cherts, gabbro, diorite, and volcanic tuffs. This complex is especially prominent in subalpine terrain from Indian Creek to Canyon Mountain on the west end of the ridge. The prominent formation east of Indian Creek and continuing eastward to Little Baldy Mountain is the huge expanse of Miocene andesites pertaining to the Strawberry Volcanics (Brown and Thayer 1966). Depths to 6,500 ft and an extension of 1,500 square miles is the result of localized vulcanism emitting from vents near Strawberry Mountain and Lookout Mountain as very explosive eruptions (Orr et al. 1992). As with the other subalpine mountains of the Blue Mountains, Pleistocene glaciation sculpted cirques, left moraines, and provided U-shaped valleys on the landscape.



Strawberry Volcanics, Little Strawberry Lake cirque

Aldrich Mountains - The Canyon Mountain Complex of highly serpentinized rock (Permian Period) anchors the east end of the Aldrich Mountains. The Fields Creek Formation (upper Triassic Period) dominates the subalpine terrain from Ingle Mountain to Fields Peak. The rocks of this formation are mudstones, shales, tuffs and greywacke with bedded andesitic tuffs (Brown and Thayer 1966). Pleistocene glaciation is not evidenced in the Aldrich Mountains.

Climate

Several climatic zones are represented in northeastern Oregon and adjacent Idaho resulting from the extremes in elevation, geographic variation, and topographic diversity throughout the area. Deep canyons in close proximity to high mountains often create climatic variations over short distances. However, the major influence to the regional climate comes from the Cascade Mountains lying nearly 200 miles to the west. This mountain range forms a barrier against modifying effects of moist winds from the Pacific Ocean and, as a result, the climate of northeastern Oregon is essentially dry. In general, climate for much of the area is categorized as temperate continental (cool summer phase) where mean temperature is less than 72°F. in the warmest month and 50°F. for more than 3 months (Trewartha 1968). Light precipitation, low relative humidity, rapid evaporation, abundant sunshine, and wide ranges in temperature are characteristic for the area, but there are marked local differences in temperature and precipitation owing to local topography.

The axis of the Blue Mountains running north to south extends through two climatic regimes. The Columbia River Gorge breaks the barrier of the Cascade Mountains to allow maritime air laden with clouds and moisture to influence the northern Blue and northern Wallowa Mountains. This is called a temperate oceanic climatic regime (Trewartha 1968). It contrasts greatly with the temperate continental climate that strongly influences the central and southern Blue Mountains and the southern Wallowa Mountains. The oceanic climatic influence provides a greater number of cloud days with higher humidity, increased precipitation, and less fluctuation in winter temperatures. The continental influence with less cloudiness, less humidity, and lower precipitation levels promotes sagebrush and juniper. The oceanic climate promotes grasslands and rhizomatous shrubs.

The differences between the northern Blue and Wallowa Mountains, and the southern Blue Mountains, can be shown by comparing the mean annual temperature and precipitation data for towns located in the mountainous environment. For example the town of Elgin is located in the northern Blue Mountains on the windward side of the Wallowa Mountains and under the influence of the Blue Mountains. It receives an average annual snowfall of 50 inches and an annual precipitation of 24 inches. Mean annual temperatures range from 33 to 62°F. and average 48°F. Anchoring the southern Blue Mountains under the continental climatic regime is Burns. Here, mean annual snowfall is 42 inches and

annual precipitation is 13 inches (almost half that falling over Elgin). Temperatures range from a mean of 29 to 57°F. with an average of 43° (Taylor and Hannan 1999). The colder temperatures and lower precipitation levels of the southern Blue Mountains provide vegetation with a Great Basin-Central Rocky Mountain flora (i.e., sagebrush/grass), whereas the higher precipitation levels and less severe temperatures of the northern Blue and Wallowa Mountains provide a Palouse-Northern Rocky Mountain flora (i.e., rhizomatous shrub/grass).

The Blue, Wallowa, and Seven Devils Mountains capture water vapors with their high peaks. In the Blue Mountains, moisture averages only 15 inches annually at lower elevations in the intermontane valleys with as much as 50 inches of moisture occurring in the higher peaks (Anderson 1975). The Blue Mountains receive only 30 to 40 inches of precipitation in a year (Pohs 2000). The higher peaks of the Wallowa Mountains are more successful at trapping the southerly storm tracks resulting in 65 to 70 inches of precipitation per year. The Seven Devils Mountains entrap 45 inches of precipitation per year (USDA 1936). The narrow uplift, along with orientation of the Seven Devils on the lee side and adjacent to the more massive Wallowa Mountain uplift, results in less precipitation for the Devils.



Bannered Rime Ice on Whitebark Pine,
Strawberry Mountain

Winter climatic conditions are noticeably influenced by maritime airborne eastward on prevailing westerly winds. The wintertime is characterized by severe cold with precipitation in the form of snow. The northeast Oregon area is often under the influence of a continental anticyclone that results in high pressure air masses that produce clear skies, lack of cloud cover, and extremely cold temperatures. The heaviest precipitation is generally in winter with a secondary period of high precipitation occurring in May and June when spring rains or wet snows fall in the mountains.

Comparisons of snow depths and precipitation amounts at selected subalpine sites provide data to support the differing environments between the Blue and Wallowa Mountains. Snow depths are available from Snowtel and snow survey sites at eight different subalpine locations in the Blue and Wallowa Mountains (www.or.nrcs.usda.gov/snow). Average snow depths measured between February and May give a good indication of the different weather patterns generated by the influence of either the continental or the maritime systems and the orientation of the respective mountainous ranges to each other.

The Wallowa Mountain sites are at Aneroid Lake (7,300 ft elevation), Mirror Lake (8,200 ft elevation), and Standley (7,400 ft elevation). Average snow depths for these sites measured from February to April were as follows:

- Aneroid Lake = 76 inches (maximum depth = 121 inches in May 1974)
- Mirror Lake = 160 inches (maximum depth = 242 inches in April 1997)
- Standley = 77 inches (maximum depth = 128 inches in May 1970)

The Blue Mountain sites are at Anthony Lake (Elkhorn Mountains at 7,130 ft) and Indian Creek Butte (Strawberry Mountains at 6,550 ft). Average snow depths for these sites measured from February to April were as follows:

- Anthony Lake = 65 inches (maximum depth = 109 inches in March 1965)
- Indian Creek Butte = 65 inches (maximum depth = 93 inches in April 1975)

Precipitation amounts taken for winter snowfall were available for three subalpine sites. Aneroid Lake and Mt. Howard (high in the Wallowa Mountains at 7,300 and 7,900 ft elevation, respectively) contrasted sharply with Snow Mountain (lower in elevation at 6,300 ft in the southern Blue Mountains). The Wallowa Mountain sites received 48 inches (Aneroid Lake) and 45 inches (Mt. Howard) contrasted to Snow Mountain with only 29 inches of precipitation. Aside from the lower elevation, Snow Mountain received lesser amounts of precipitation owing to the influence of the continental air mass and its drier snowfall.

Management Considerations

Subalpine plant communities are located at high elevations (generally above 7,000 ft) where climatic condition shorten growing seasons and provide long periods of snow cover to the ground. Managers of those lands are limited in the ability to effect changes as a result. Silviculture options are extremely limited owing to accessibility with much of the acreage in this study located in wilderness areas. The primary management functions that can be conducted in subalpine environments are related to disturbances caused by fire, ungulates, and people. Therefore, the management functions tend to be in fire, range, and recreation management regarding projects within subalpine zones.

Forest Communities

Mountain Hemlock Communities

Mountain hemlock communities are important for watershed values. They insulate the snowpack allowing for moisture retention into the late summer.

Fire - Many old-growth stands have survived periodic fire owing to their location and wetness late into the summer. Mountain hemlock appears to be increasing in subalpine fir-Engelmann spruce communities at the higher elevations of the Wallowas. This may be a result of fire suppression. Mountain hemlock stands on gentle topography are subject to stand-replacement fires late in the growing season. These sites may revert to lodgepole pine-dominated early seral stands.

Silvicultural considerations - Silvicultural opportunities may be very limiting owing to cold soil and air temperatures, short growing seasons, and heavy long-lasting snowpacks. Tree succession following disturbance is generally quite slow.

Livestock and wildlife - These communities provide little forage for ungulates but do provide the coolest mid-day cover for shading animals. Slopes are often steep, making many stands unattractive except to the transient animal (Johnson and Simon 1987).

Limber Pine Communities



South Fork of Middle Fork, Imnaha River,
Wallowa Mountains

Fire - The isolated, clumpy nature of stands coupled with low fuel accumulations, late snowmelt, and low coverage of understory shrubs and herbs reduces the vulnerability to fires. Older trees survive stem scorch; younger trees are susceptible to low-severity fires.

Silvicultural considerations - Very limited owing to short grazing seasons, cold soil and air temperatures, and lack of commercial value. Tree reproduction is sporadic and low.

Livestock and wildlife - Forage production is low. Mule deer use the island-like clumps for cover. Highest value is production of nutritious seeds for squirrels and birds.

Whitebark Pine Communities



Seven Devils Mountains

Fire - Mature whitebark pine are vulnerable to moderate and severe burns. Many stands are island-like with tree mortality often limited to a grove or clump. White pine blister rust mortality is currently severe in whitebark pines of the Elkhorns and Strawberry Mountains. The ignitions in stands with dead tree snags generally result in a crowning movement by fire resulting in higher than normal whitebark pine mortality of associated live trees. Seed for replacement whitebark pines are eliminated in severe crowning burns. Exclusion of fire (burning lightly and periodically) in whitebark pine communities promotes subalpine fir (fire sensitive) and exacerbates the vulnerability to crown fire of whitebark pine. Seed caches by the Clark's nutcracker provides the principal source for seedling establishment by whitebark pines. Openings for new stands are provided by surface fires of mixed severities where mineral soil is exposed. The nutcrackers will continue to cache seeds as long as openings are promoted by burns.

Silvicultural consideration - Very limited owing to short growing seasons, cold air and soil temperatures, and lack of commercial value.

Livestock and wildlife - Stands provide habitat for mule deer, elk, black bear, mountain goats, birds, and small mammals. Clark's nutcracker populations are intrinsically tied to whitebark pine vitality.

Watershed - High-elevation whitebark pines retain high snowpacks and are valuable in the timing, quantity, and quality of water provided to stream courses.

Recreation - The tree is valued by photographers and backcountry users for its beauty. Whitebark pines provide desirable campsite protection and shelter from storms.

Subalpine Fir Communities



Summit Ridge, Hells Canyon National Recreation Area, Wallowa Mountains

Fire - Subalpine fir stands are readily killed by stand-replacing crown fires as well as surface fires. The trees are susceptible to the heat owing to thin bark, lower branches, shallow roots, and flammable foliage. The tendency to grow in dense stands adds to fire vulnerability-especially in whitebark pine-subalpine fir communities. Following fire, lodgepole pine seeds aggressively germinate with dense, dominant stands resulting in 5 to 10 years. Pioneering after severe burns are fireweeds, pearly everlasting, black elderberry, and Scouler willow. Increasing after moderate-severe burns are Ross' sedge and heartleaf arnica. Grouse huckleberry and big huckleberry resprout readily to dominate after 5 years (Johnson 1998). Spruce and whitebark pine can be fire survivors in subalpine fir forests where moist microsites or microtopographic features protect them for long-term site occupancy.

Silvicultural considerations - Removal of trees results in decreased soil temperatures. Lodgepole pine will be favored as will increases in shrubs. Subalpine fir will be retarded successionaly. Cold temperatures, long snow cover periods, and high frosts are major limitations to silvicultural activities.

Livestock and wildlife - Forage production is generally low. Habitat is provided for mule deer, elk, and black bear in summer. Squirrels, chipmunks, woodpeckers, nuthatches, juncos, chickadees, and other small mammals and birds are occupants of subalpine fir communities. Grouse and mountain goats use the needles and buds (especially in winter). Seeds are consumed by squirrels, chipmunks, and birds (especially nuthatches, juncos, chickadees, and Clark's nutcracker).

Recreation - Subalpine fir-dominated forests are the most prominent in the subalpine zone (above 7,000 ft elevation). Trails provide access through stands, vista points look across landscapes covered by subalpine fir communities, and shelter is provided at campsites often located among these trees.

Grand Fir Communities

Fire - Grand fir is highly susceptible to fire. At subalpine elevations, fires often burn with varying severities resulting in a mosaic of stand-replacement and underburn patches. Lodgepole pine pioneers on severely burned sites. Fire also promotes western larch and Douglas-fir as fire seral species. On severely burned sites, bracken and snowbrush ceanothus may pioneer and remain as long-term occupants delaying and retarding tree regeneration (Johnson 1998). Scouler willow and fireweeds are prominent after fire in grand fir/big huckleberry communities. Grand fir/pinegrass communities require frequent fire for pinegrass maintenance.

Livestock and wildlife - Forage is provided and utilized in late season by elk, deer, and livestock in grand fir/pinegrass communities. Little forage is afforded by grand fir/big huckleberry communities. Grand fir/big huckleberry forests provide key habitat for bear, grouse, and mule deer. Thermal and hiding cover is provided for elk and deer. Small mammals that use grand fir communities in the subalpine are squirrels and chipmunks. Crossbills, flickers, grouse, nuthatches, and pileated woodpeckers are among many birds occupying grand fir forests.

Douglas-Fir Communities

Fire - Mature Douglas-fir trees are fire resistant. Young trees are susceptible to fire damage on account of thin bark and resins. In communities with pinegrass and elk sedge, moderate to light burns enhance pinegrass, elk sedge, and lupine occupancy (Johnson 1998).

Livestock and wildlife - The mature subalpine Douglas-fir forests generally contain elk sedge or pinegrass. These species are less palatable than other grasses. Use is either early on succulent new growth or late in summer or early fall when frosts soften culms and leaves. Elk, deer, and livestock use Douglas-fir forests. Birds using seeds in the subalpine are Clark's nutcracker, chickadees, nuthatches, crossbills, juncos, and pine siskins (USDA Forest Service 2003). Blue grouse use Douglas-fir forests for roosting and foraging on buds and needles.

Shrublands

Mountain-Mahogany Communities

Fire - These trees are very susceptible to fire, but stands tend to occupy rocky sites where surface fuels are generally insufficient to carry fire. Stand regeneration is from seed stored in ground, from crowns of fire-killed trees, or from wind-dispersed seed (USDA Forest Service 2003).

Livestock and wildlife - Mule deer rely on mountain-mahogany as a key browse species on winter rangelands. Stands provide thermal and hiding cover for deer, elk, and bighorn sheep. Browse use is extremely heavy resulting in severe hedging of young plants and high lines of older shrub canopies. Ungulate use of young plants seriously jeopardizes the vitality of the community by eliminating younger age classes throughout much of the range of the shrubs.

Recreation - Important for hunters seeking mule deer.

Mountain Big Sagebrush Communities

Fire - Mountain big sagebrush is very susceptible to fire injury. If root crowns are not killed, it will resprout. Severe burns reduce the density of sagebrush on sites with regeneration by onsite seed. Moderate to light burns reduce sagebrush foliar cover for 10 to 15 years. Most shrubs resprout from bases following moderate or light burns (Johnson 1998).

Livestock and wildlife - Mountain big sagebrush is a winter forage for mule deer (USDA Forest Service 2003). These shrubland communities provide important habitat for gophers, marmots, ground squirrels, mice, and voles. Grouse, songbirds, and small mammals utilize the communities for cover and food.

Recreation - Important for hunters seeking grouse and mule deer.

Grasslands

Green Fescue Communities

Fire - Subalpine grasslands are infrequently burned. Even in late summer/early autumn moisture contents and ambient temperatures/humidity levels are sufficient to retard moderate to severe burns. Preburn and postburn data are not available.

Livestock and wildlife - Green fescue rangelands in the Wallowa Mountains were severely overgrazed by domestic sheep prior to 1900 (Reid et al. 1991). Monitoring of sites since 1938 has demonstrated an upward successional trend through 1978 in the Tenderfoot Basin of the Wallowa Mountains (Reid et al. 1980). The increase in elk herds in the 1980s caused a downward successional trend on some Tenderfoot Basin

green fescue rangelands in the decade 1988 to 1998 (Johnson 2003). Green fescue communities provide primary forage for elk and mule deer in mid to late summer. Marmots, pocket gopher, mice, and voles utilize these communities.

Recreation - Important for pack stock of recreationists, outfitters, and guides. Green fescue grasslands provide a pleasing variety to the coniferous forest dominance in the subalpine.

Idaho Fescue Communities

Fire - Idaho fescue plants are sensitive to severe burns. The fine leaves allow fire to linger and burn into the crown. Moderate and light burns are less damaging to the bunchgrass. Annual forbs and annual grasses increase the first year after moderate and light burns but generally decline by the fifth year after the burn (Johnson 1998). Bluebunch wheatgrass will maintain its occupancy on Idaho fescue sites or increase opportunistically as fescue declines in the community.

Livestock and wildlife - Idaho fescue is preferred by elk, bighorn sheep, and mountain goats early in the growing season when leaves are succulent. Domestic livestock use the species at higher elevations in late summer or early fall when rains bring regrowth. Grouse use the seeds.

Recreation - Idaho fescue communities dominate the subalpine grasslands in the Blue Mountain subalpine. Ridges and summits of fescue often provide a pleasing diversity to the hiker, hunter, or backcountry horseman.

Elk Sedge Communities

Fire - Like pinegrass, elk sedge resprouts from rhizomes following disturbance by fire. It maintains or enhances its site occupancy with fire. Moderate and light burns appear to favor its increase; severed burns may cause a short-term decline in its abundance.

Livestock and wildlife - Generally ungulates have a low preference for elk sedge. It is used in early summer by black bear, mule deer, and elk in the subalpine. Its ability to maintain green culms and leaves throughout the summer drought period make it appealing to ungulates. It is only lightly used in summer.

The Plant Association Concept

The vegetation of the subalpine and alpine zones has been classified by using the plant association concept for characterizing vegetation based on successional relationships and probable climax species. The following definitions and examples may provide assistance to the user to better understand the categorizations given to the vegetation.

Plant Communities

The plant community is a general term for an assemblage of plants living together and interacting among themselves in a common spatial arrangement (Society for Range Management 1989). It is not a taxonomic unit, has no successional status, and may not be recognized by all investigators. Analogous to "plant communities" are "common names" where no bounds have been set or rules defined by which a particular common name is used. Many plant communities have been sampled that differ in compositional and environmental parameters.

The purpose of this classification is to segment the moisture-temperature gradient through recognition of indicative plant species in such a way as to provide easier recognition of similar environments across the landscape. In the analysis of plot data, certain plant communities were undersampled or did not provide adequate representation in the geographic area encompassed by the classification. These "communities" have been given a minimal description and entered in the text and key to recognize the fact that they exist. More information is needed to change their status of "plant community."

Plant Associations

A *plant association* (p.a.) is "a recurring plant community with a characteristic range in species composition, specific diagnostic species, and a defined range in habitat conditions and physiognomy or structure" (Winthers, et al. 2001). Plant associations are named after diagnostic tree, shrub, and herb species. As a combination of similar or compensating environmental factors are repeated across the landscape, a predictable plant community will occupy those sites given time and the lack of disturbance. This will be a *plant association*.

Plant Community Types

The *plant community type* (p.c.t.) is an aggregation of all plant communities distinguished by floristic and structural similarities in both overstory and undergrowth layers. These are units within a classification (Society for Range Management 1989).

Plant community type (p.c.t.) status was assigned when there were enough sampled plots to portray a vegetation pattern but where the standard necessary for plant association status was not met. An example would be green fescue Hood's sedge where the type was determined to represent a seral stage of a green fescue plant association. Other examples of plant community type assignment went to vegetation where sample size was determined to be too minimal for plant association status. Ideally, 10 sample plots or more are used to portray a plant association. An example from this classification is Idaho fescue-red avens ($n = 4$). Note that some vegetation was given plant association status with low "n" values based on stronger affiliation at mid-montane levels where previous classifications had given plant

association status (i.e., Plant Associations of the Wallowa-Snake Province, Plant Associations of the Blue-Ochoco Mountains).

Communities (comm.) are provided from the classification for those plant communities encountered that were limited in occurrence. Not enough information was found to typify as a plant association or a plant community type.

Series

This field guide aggregates the taxonomically related plant associations into series. The name of the series is that of the climax species dominating the principal layer. An example would be the subalpine fir series in which all subalpine fir plant associations are arrayed, as well as the seral plant community types and community fragments, related to subalpine fir climax as potential vegetation.

Successional Terminology

Stability with the environment is crucial to the succession of plant communities that ameliorate a site and permit the establishment and maintenance of the "potential natural community."

In vegetation sampling, ecologists seek those stands that appear to demonstrate stability in order to understand the plant composition and environments that can be characterized in a plant association classification, i.e., a classification of potential natural vegetation.

However, the landscape in the subalpine and alpine environments has undergone, and continues to undergo, modifications that prevent the formation of long-term stable communities. Some natural events (fire, windstorms, grazing and browsing animals) along with human-induced disturbances (livestock grazing) tend to forestall or disrupt the natural development of vegetation leading to communities with more stable composition and structure.

Succession may be arrested (i.e., maintained by fire at a particular stage), accelerated (i.e., mortality of seral tree species from insects, diseases, windthrow), and retarded (i.e., continued ungulate grazing pressure, which degrades the grassland from perennial to annual vegetation dominance).

The identifiable stages of vegetation preceding potential natural communities are termed "seral stages." In the development of this classification, plots representing various seral stages were used to define "plant community types" as well as the "plant associations." Generally, very early and early seral stages were grouped into plant community types; mid and late seral stages were grouped to define plant associations, as they depict the least change over time and therefore have a more stable composition and structure over time.

Zonal Relationships

Individual species occur in a predictable pattern, or juxtaposition, with a unit of area based on the microenvironment. Plant associations likewise will tend to occupy predictable positions in a landscape based on habitat features favorable to support the climax community. The principal species that constitutes the climax dominants predictably occupy environmental zones within a climatic gradient where temperature and moisture vary with change in elevation. An example of a zonal sequence by "series" in the subalpine classification would be whitebark pine, subalpine fir, grand fir, and Douglas-fir. The orientation is from cold (moist to dry) to warm (moist to dry).

Indicator Species

The habitat needs of plant species are evident by the environment in which they persist. Some species require stable conditions, others thrive on recurring instability. Some species have adapted to a particular locale owing to long-term climatic conditions of the area; others have colonized and thrived owing to changes in the microclimate of a particular site.

Plants that designate thresholds of environmental changes along gradients are called *indicator plants*. The plants selected to define the plant community type or the plant association are those deemed to be the most diagnostic of a particular environment, i.e., those that have a high fidelity and constancy to the type. These are called "*indicator plants*." Although they do not necessarily indicate the sum of all environmental conditions, they are considered the best candidates of the associated flora within a classified type to indicate the occurrence and distribution of that vegetation unit.

The indicator species selected are those sought by field investigators to help determine proper assignment to a given plant association or plant community type. The plant species required to know for use in determining the proper plant association, plant community type, or plant community is provided in this publication with identification information to assist the user.

Data Analyses

Data analyses were accomplished with computer programs developed or adapted by Pacific Northwest Region (Region 6) ecologists (Wheeler 1987, Volland and Connelly 1978). Following an initial data-preparation phase, a series of subjective group orderings were created with consideration given to previous classification efforts in northeastern Oregon and adjacent national forest lands (Hall 1973, Johnson and Clausnitzer 1992, Johnson and Simon 1987).

Additionally, ordination and classification programs, CLUSTER 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. Displays of these gradients, along with productivity indices, were inspected to adjust previously developed units (plant associations and plant community types). Plot memberships were derived, and stand association tables with summary statistics were produced.

Format of the Vegetation Descriptions

Headings

Plant associations and plant community types are named by using the potential (climax) dominant species followed by the indicative subordinate species of a different life form. An example is whitebark pine/alpine prickly currant/skunk-leaved polemonium. This is tree/shrub/forb. The life forms of different "layers" are separated by a slash (/). When plants are used to name a vegetation type from the same layer and life form, a dash (-) is used. An example is subalpine fir-Engelmann spruce/Labrador tea.

The names of the vegetation types are provided in three formats:

- by common names (subalpine fir- Engelmann spruce/Labrador tea)
- by scientific names (*Abies lasiocarpa-Picea engelmannii/Ledum glandulosum*)
- by computer codes (ABLA-PIEN/LEGL)

All scientific names follow Hitchcock and Cronquist 1977. All computer codes follow version USDA-NRCS 2001. All plant species encountered in the study are listed in the appendix by scientific and common names as well as the computer codes.

Photos

A representative image of the plant community was selected for most major vegetation types. The reference pole used is 1 meter tall and segmented into decimeters to assist in visualizing the size of the vegetation.

Distribution - The mountain ranges in which the vegetation type can occur.

Environmental features - The elevational range, slope percentage, aspect, microtopography, slope orientation, and geologic information from sampled plots.

Soils - A brief description of the soil attributes from sampled plots.

Vegetation composition - A description of the vegetation based on plant species found and percentage of composition of the plants from sampled plots.

Successional relationships - A brief narrative of the successional dynamics of key plants and their environmental requirements.

Disturbance ecology - The response to disturbance by plants and the community. Principal disturbances influencing the subalpine/alpine vegetation have been fire, grazing, insects, and disease epidemics.

Relationship to other studies - The relationship of this vegetation type to other similar classified vegetation types published in the Pacific Northwest.

Table of environmental features - Table gives sample size (e.g., n = 10). Means and ranges are given for elevation, aspect, slope, and soils from sampled plots. Geologic information, slope position, and microrelief are summarized. If ages were taken in forest stands, that information is provided. In shrub/grass and grassland communities, herbage productivity is often provided.

Table of principal species - Table contains a species list selected from the complete list of species found for a vegetation type. Only the primary species necessary for the description and the keys are listed. Mean coverage values in percentages and the range of cover values in percentages are provided for the selected species. Constancy values are given in percentages as well. Constancy refers to the percentage of frequency of occurrence of a species in the total number of plots used for describing the vegetation type.

Table of ground surface features - Percentage of cover, percentage of constancy, and the range of cover values are provided for the cover of the ground beneath the higher plants. Bare ground, rock, gravel, mosses, lichens, and litter are the surface cover features.

Estimating Cover

The following table is provided to help the field investigator make ocular estimates of abundance (crown canopy cover) of indicator plants for use in determining the proper vegetation type by using the keys.

% canopy coverage	Plot size*			
	375 m ²		1/10 acre	
	x**	r***	x**	r***
1	1.94 m (6.36 ft)	1.09 m (3.58 ft)	6.6 ft (2.01 m)	3.72 ft (1.13 m)
5	4.33 m (14.20 ft)	2.44 m (8 ft)	14.76 ft (4.5 m)	8.33 ft (2.54 m)
10	6.12 m (20.07 ft)	3.45 m (11.32 ft)	20.87 ft (6.37 m)	11.78 ft (3.59 m)

* Radius of 375 m² = 10.93 (35.85 ft)
Radius of 1/10 acre = 11.32 m (37.24 ft)

** x is the dimension of one side of a square equal to the percentage of cover.

*** R is the radius of a circular area equal to the percentage of cover.

Keys for Subalpine and Alpine Vegetation

The keys that follow assist in determining which plant association, plant community type, or community best fits a particular site.

Cover Percentages

The keys use percentage of cover breaks, which require the user to determine the canopy coverage of a particular species in the field. The key indicator species is the species determined to be more sensitive to the environment. If it is determined that the limited amount of a particular indicator species represents a microsite, rather than the stand being sampled, then the less restrictive classified type should be used instead of the vegetation represented on the microsite.

Trees and shrubs, which tend to be individually clumped, are generally separated by using 10% as a break. Rhizomatous and stoloniferous shrubs, grasses, sedges, and larger forbs are generally separated by using a 5% break. The larger indicator plants with a wider ecologic amplitude would be incidentally in the plot at a lower coverage break.

There are limitations to the use of the keys and certain rules must be followed.

Limitations

1. The keys are based on 584 sampled plots located across the extent of the axes of the Wallowa, Blue, and Seven Devils Mountains. This large geographic area contains a high variation in plant communities and environments. Not all the environmental variation was sampled; therefore, the classification may not describe the vegetation occurring on some sites.
2. The natural stands have been, and continue to be, highly modified. Sites exhibiting severe disturbances may not be readily determined from these keys.
3. Depauperate forest understories may not contain indicator plant species in sufficient abundance to properly assign using this key. Depauperate stands are usually mature with sparse ground vegetation. The lack of ground vegetation may result from heavy litter accumulation, dense tree stocking, or the environment.
4. Some higher elevation montane plant associations have been included in this study. These are generally found below subalpine environments (under 7,000 ft elevation). They were included to provide a portrayal of the colder environmental end of the vegetation encountered in these associations. Examples are the three associations pertaining to the grand fir series and Douglas-fir/pinegrass plant association.

Rules for Use

1. Select sites supporting vegetation demonstrating maturity and stability. On sites where disturbance has been severe, resulting in vegetation representing early seral stages, select an adjacent area determined to represent a similar site for examination and determination of the plant association or plant community type.
2. Determine the proper vegetation type by selecting the proper series from the series key. Then proceed to the correct "lead" (i.e., whitebark pine is correct; go to lead "4a"). Then determine if the next "lead" is either "1a" or "1b" and proceed down the key until you find the kind of vegetation encountered on the site. Then turn to the page number provided and review the type description to verify the accuracy of the identification.
3. In stands where the undergrowth vegetation is depauperate owing to dense tree overstories or thick duff accumulation inhibiting plant growth, adjustment of the coverage percentages downward may be necessary to properly key to the correct plant association or plant community type. The other alternative is to move to an adjacent stand where light and surface conditions have permitted a better expression of the understory vegetation.

Key to Subalpine and Alpine Vegetation

Series Key

A. Trees present with coverage equal to or exceeding 5% (Forest)	B
A. Trees absent or with coverage less than 5%	H
B. Mountain hemlock reproducing with cover equal to or exceeding 5% (Mountain hemlock series)	1a
B. Mountain hemlock absent or with cover less than 5%	C
C. Limber pine reproducing with cover equal to or exceeding 5% (Limber pine series)	3a
C. Limber pine absent or with cover less than 5%	D
D. Whitebark pine reproducing with cover equal to or exceeding 5% (Whitebark pine series)	4a
D. Whitebark pine absent or reproducing with cover less than 5%	E
E. Subalpine fir reproducing with cover equal to or exceeding 5% (Subalpine fir series)	14a
E. Subalpine fir absent or reproducing with cover less than 5%	F
F. Grand fir reproducing with cover equal to or exceeding 10% (Grand fir series)	55a
F. Grand fir absent or reproducing with cover less than 10%	G
G. Douglas-fir reproducing with cover equal to or exceeding 10% (Douglas-fir series)	58a
G. Douglas-fir absent or reproducing with cover less than 10%	H
H. Rocky Mountain juniper or quaking aspen dominant	64a
H. Rocky Mountain juniper or quaking aspen absent	I
I. Shrubs present with coverage equal to or exceeding 5% (shrublands)	65a
I. Shrubs absent or present with coverage less than 5%	J
J. Grasses, Hood's sedge, elk sedge or rushes equal to or exceeding 5%	79a
J. Forbs or sedges (other than Hood's sedge or elk sedge) dominant	109a

Mountain Hemlock (TSME) Series

1a. mountain hemlock (TSME) reproducing at greater than 5% cover of tree understory species	2
2a. big huckleberry present at 1% or greater in coverage TSME/VAME (p. 65)	
2b. big huckleberry absent or present at less than 1% coverage TSME/VASC (p. 62)	
1b. mountain hemlock (TSME) not indicated as the potential tree species	3

Limber Pine (PIFL2) Series

3a. limber pine (PIFL2) reproducing at greater than 5% cover; absence of whitebark pine	PIFL2/JUCO6 (p. 68)
3b. limber pine absent or present at less than 5% cover	4

Whitebark Pine (PIAL) Series

4a. whitebark pine (PIAL) reproducing at greater than 5% cover of tree understory species	5
4b. whitebark pine absent; Engelmann spruce or subalpine fir cover greater than 10%	28
5a. subalpine fir understory cover less than 5%	6
5b. subalpine fir understory cover greater than 5%	14
6a. mountain gooseberry (RIMO2) present at 1% or greater in coverage PIAL/RIMO2/POPU3 (p. 71)	
6b. mountain gooseberry absent or present at less than 1% coverage	7
7a. Smooth woodrush (LUHI4) present at 5% or greater in coverage PIAL/VASC/LUHI4 (p. 74)	
7b. Smooth woodrush absent or present at less than 5% coverage	8
8a. green fescue (FEVI) present at 3% or greater in coverage PIAL/FEVI (p. 77)	
8b. green fescue absent or present at less than 3% coverage	9
9a. elk sedge (CAGE2) present at greater than 5% coverage PIAL/CAGE2 (p. 80)	
9b. elk sedge less than 5% coverage	10
10a. grouse huckleberry (VASC) present at greater than 5% coverage	9
11a. heartleaf arnica (ARCO9) cover greater than 5% PIAL/VASC/ARCO9 (p. 86)	
11b. prickly sandwort (ARAC2) cover greater than 5% PIAL/VASC/ARAC2 (p. 83)	
10b. grouse huckleberry absent or with cover less than 5%	13
12a. prickly sandwort (ARAC2) cover greater than 5% PIAL/ARAC2 (p. 86)	
12b. prickly sandwort cover less than 5%	11
13a. common juniper and pinemat manzanita dominant PIAL/JUCO6/ARNE (p. 87)	
13b. whitebark pine occupying grus with silvery lupine PIAL/LUAR3 (p. 86)	

Subalpine Fir Series

14a. mountain gooseberry (RIMO2) present at 5% or greater coverage	ABLA-PIAL/RIMO2/POPU3 (p. 88)	
14b. mountain gooseberry absent or present at less than 5% coverage		15
15a. common juniper (JUCO6) present at 5% or greater coverage		16
16a. pinemat manzanita (ARNE) cover 5% or greater	ABLA-PIAL/JUCO6/ARNE (p. 112)	
16b. pinemat manzanita absent or with cover less than 5%	ABLA-PIAL/JUCO6 (p. 112)	
15b. common juniper absent or present at less than 5% coverage		17
17a. grouse huckleberry (VASC) present at greater than 10% coverage		18
18a. pink mountain heath present at 5% cover or greater	ABLA-PIAL/VASC/PHEM (p. 100)	
18b. pink mountain heath absent or with cover less than 5%		19
19a. heartleaf arnica (ARCO9) greater than 5% coverage	ABLA-PIAL/VASC/ARCO9 (p. 91)	
19b. heartleaf arnica absent or with coverage less than 5%		20
20a. green fescue (FEVI) greater than 5% coverage	ABLA-PIAL/VASC/FEVI (p. 112)	
20b. green fescue absent or with coverage less than 5%		21
21a. Ross' sedge (CARO5) present at 1% cover or greater	ABLA-PIAL/VASC/CARO5 (p. 94)	
21b. Ross' sedge absent or with cover less than 1%		22
22a. little ricegrass (OREX) present at 1% cover or greater	ABLA-PIAL/VASC/OREX (p. 113)	
22b. little ricegrass absent or with cover less than 1%		23
23a. prickly sandwort (ARAC2) present at 1% cover or greater	ABLA-PIAL/VASC/ARAC2 (p. 97)	
23b. prickly sandwort absent or with cover less than 1%	ABLA-PIAL/VASC/LECOW2 (p. 113)	
17b. grouse huckleberry absent or with cover less than 10%		24
24a. green fescue present at 5% or greater in coverage	ABLA-PIAL/FEVI (p. 103)	
24b. green fescue absent or with cover less than 5%		25
25a. elk sedge (CAGE2) present at 5% or greater coverage	ABLA-PIAL/CAGE2 (p. 106)	
25b. elk sedge absent or at less than 5% coverage		26
26a. skunk-leaved polemonium (POPU3) present at 5% or greater	ABLA-PIAL/POPU3 (p. 114)	
26b. skunk-leaved polemonium absent or at coverage less than 5%		27
27a. Parry's rush present at 1% cover or greater	ABLA-PIAL/JUPA-STLE2 (p. 109)	
27b. prickly sandwort present at 1% cover or greater	ABLA-PIAL/ARAC2 (p. 113)	
28a. Engelmann spruce (PIEN) present and reproducing with subalpine fir in the tree understory	ABLA-PIEN	29
28b. Engelmann spruce absent in the tree understory		40
29a. Labrador tea (LEGL) present at 5% or greater coverage	ABLA-PIEN/LEGL (p. 115)	
29b. Labrador tea absent or present at less than 5% coverage		30
30a. Fool's huckleberry (MEFE) present at 10% cover or greater	ABLA-PIEN/MEFE (p. 119)	
30b. Fool's huckleberry absent or with cover less than 10%		31
31a. white rhododendron (RHAL2) present at 10% cover or greater	ABLA-PIEN/RHAL2 (p. 129)	
31b. white rhododendron absent or with cover less than 10%		32
32a. grouse huckleberry (VASC) present at 5% cover or greater		33
33a. pink mountain heath (PHEM) present at 5% cover or more	ABLA-PIEN/VASC-PHEM (p. 129)	
33b. pink mountain heath absent or with cover less than 5%	ABLA/VASC (p. 141)	
32b. grouse huckleberry absent or with cover less than 5%		34
34a. arrowleaf groundsel (SETR) present at 5% cover or greater	ABLA-PIEN/SETR (p. 128)	
34b. arrowleaf groundsel absent or with cover less than 5%		35
35a. false bugbane (TRCA) present with coverage greater than 1%	ABLA-PIEN/TRCA (p. 128)	
35b. false bugbane absent or with cover less than 1%		36
36a. beadlilly (CLUN2) present with coverage greater than 1%	ABLA-PIEN/CLUN2 (p. 122)	
36b. beadlilly absent or with cover less than 1%		37
37a. twinflower (LIBO3) present with cover greater than 5%	ABLA-PIEN/LIBO3 (p. 128)	
37b. twinflower absent or with cover less than 5%		38
38a. Smooth woodrush (LUHI4) present with cover 5% or greater	ABLA-PIEN/LUHI4 (p. 129)	
38b. Smooth woodrush absent or with cover less than 5%		39
39a. Heartleaf arnica (ARCO9) present at 5% or greater coverage	ABLA-PIEN/ARCO9 (p. 125)	
39b. skunk-leaved polemonium (POPU3) present at 1% or greater cover	ABLA-PIEN/POPU3 (p. 130)	
40a. subalpine fir (ABLA) reproducing at 5% or greater in the tree understory and with Engelmann spruce understory cover less than 5%		41
40b. subalpine fir absent or present in the tree understory at less than 5%		55
41a. beargrass (XETE) present with coverage greater than 5%	ABLA/XETE (p. 157)	
41b. beargrass absent or with cover less than 5%		42

42a. pinemat manzanita (ARNE) present with coverage greater than 5%	ABLA/ARNE/ARAC2 (p. 157)	
42b. pinemat manzanita absent or with cover less than 5%		43
43a. twinflower (LIBO3) present with coverage greater than 5%	ABLA/LIBO3 (p. 131)	
43b. twinflower absent or with cover less than 5%		44
44a. big huckleberry (VAME) present at 5% or greater coverage	ABLA/VAME (p. 134)	
44b. big huckleberry absent or present at less than 5% coverage		45
45a. pink mountain heath (PHEM) present at 5% or greater coverage	ABLA/VASC-PHEM (p. 138)	
45b. pink mountain heath absent or with coverage less than 5%		46
46a. Prince's pine (CHUM) present beneath western white pine (PIMO3)	ABLA-PIMO3/CHUM (p. 157)	
46b. western white pine absent in the subalpine fir stand		47
47a. green fescue (FEVI) present with cover 5% or greater	ABLA/FEVI (p. 158)	
47b. green fescue absent or with coverage less than 5%		48
48a. heartleaf arnica (ARCO9) present at 5% or greater coverage	ABLA/ARCO9 (p. 145)	
48b. heartleaf arnica absent or with coverage less than 5%		49
49a. pinegrass (CARU) present at 5% or greater coverage	ABLA/CARU (p. 148)	
49b. pinegrass absent or with coverage less than 5%		50
50a. elk sedge (CAGE2) present at 5% or greater coverage	ABLA/CAGE2 (p. 151)	
50b. elk sedge absent or with coverage less than 5%		51
51a. skunk-leaved polemonium (POPU3) present with cover 1% or greater	ABLA/POPU3 (p. 154)	
51b. skunk-leaved polemonium absent or with coverage less than 1%		52
52a. rushes present at 1% or greater cover		53
53a. Drummond's rush (JUDR) present at 1% or greater	ABLA/JUDR (p. 158)	
53b. slender rush (JUTE) present at 1% or greater	ABLA/JUTE (p. 159)	
52b. rushes absent or present at less than 1% cover		54
54a. alpine fleecflower (POPH) present at 1% cover or greater	ABLA/POPH (p. 158)	
54b. western needlegrass (STOC) present at 1% cover or greater	ABLA/STOC (p. 159)	

Grand Fir Series (High elevation habitats above 5500 ft elevation)

55a. grand fir (ABGR) reproducing with coverage equal to or exceeding 10% in the tree understory		56
55b. grand fir absent or present in the tree understory at less than 10% coverage		58
56a. big huckleberry (VAME) present with coverage equal to or exceeding 5%	ABGR/VAME (p. 165)	
56b. big huckleberry absent or with coverage less than 5%		57
57a. pinegrass (CARU) present at 5% or greater coverage	ABGR/CARU (p. 162)	
57b. pinegrass absent or with coverage less than 5%; elk sedge coverage at 5% or greater	ABGR/CAGE2 (p. 160)	

Douglas-fir Series (High elevation habitats above 6000 ft elevation)

58a. Douglas-fir (PSME) reproducing with coverage equal to or exceeding 10% in the tree understory		59
59a. Rocky Mountain maple (ACGL) present at 5% cover or greater	PSME/ACGL-SYOR2 (p. 174)	
59b. Rocky Mountain maple absent or with cover less than 5%		60
60a. mountain snowberry (SYOR2) present at 5% coverage or greater	PSME/SYOR2/CAGE2 (p. 174)	
60b. mountain snowberry absent or with coverage less than 5%		61
61a. mountain gooseberry (RIMO2) present at 5% coverage or greater	PSME/RIMO2/POPU3 (p. 175)	
61b. mountain gooseberry absent or with coverage less than 5%		62
62a. pinemat manzanita (ARNE) present at 5% coverage or greater	PSME/ARNE/CAGE2 (p. 168)	
62b. pinemat manzanita absent or with coverage less than 5%		63
63a. pinegrass (CARU) present at 5% coverage or greater	PSME/CARU (p. 171)	
63b. pinegrass absent or with coverage less than 5%; Idaho fescue dominant	PSME-PIPO-JUOC/FEID (p. 175)	

Other Forest Types

58b. Douglas-fir absent or present in tree understory at less than 10% coverage		64
64a. Rocky Mountain juniper (JUSC2) dominant at 10% cover or greater	JUSC2/CELE3 (p. 176)	
64b. quaking aspen (POTR5) dominant at 10% cover or greater	POTR5/CAGE2 (p. 176)	

Key to Subalpine Shrublands

- 65a. mountain-mahogany (CELE3) present; coverage equals or exceeds 10% 66
 66a. elk sedge (CAGE2) present; coverage equals or exceeds 5%
 CELE3/CAGE2 (p. 203)
 66b. Idaho fescue (FEID) or bluebunch wheatgrass (AGSP)
 coverage equals or exceeds 5%
 CELE3/FEID-AGSP (p. 204)
- 65b. mountain-mahogany absent or with coverage less than 10% 67
 67a. mountain big sagebrush (ARTRV) present; coverage equals or exceeds 5% 68
 67b. mountain big sagebrush absent or with coverage less than 5% 75
 68a. mountain snowberry (SYOR2) present; coverage equals or exceeds 5% ARTRV-SYOR2/BRCA5 (p. 208)
 68b. mountain snowberry absent or with coverage less than 5% 69
 69a. elk sedge (CAGE2) present; coverage equals or exceeds 10%
 ARTRV/CAGE2 (p. 210)
 69b. elk sedge absent or with coverage less than 10% 70
 70a. green fescue (FEVI) present; coverage equals or exceeds 5% ARTRV/FEVI (p. 214)
 70b. green fescue absent or with coverage less than 5% 71
 71a. mountain brome (BRCA5) present; coverage equals or exceeds 5% ARTRV/BRCA5 (p. 220)
 71b. mountain brome absent or with coverage less than 5% 72
 72a. Hood's sedge (CAHO5) present; coverage equals or exceeds 5% ARTRV/CAHO5 (p. 220)
 72b. Hood's sedge absent or with coverage less than 5% 73
 73a. Idaho fescue (FEID) present; coverage equals or exceeds 5% ARTRV/FEID-AGSP (p. 217)
 73b. Idaho fescue absent or with coverage less than 5% 74
 74a. linanthastrum (LINU4) present; coverage equals or exceeds 5% ARTRV/LINU4 (p. 221)
 74b. linanthastrum absent or with coverage less than 5%
 ARTRV/ERFL4-PHLOX (p. 221)
- 75a. low sagebrush (ARAR8) present; coverage equals or exceeds 10%
 ARAR8/FEID-AGSP (p. 223)
 75b. low sagebrush absent or with coverage less than 10% 76
 76a. shrubby cinquefoil (POFR4) present; coverage exceeds 5%
 POFR4/FEID (p. 226)
 76b. shrubby cinquefoil absent or with coverage less than 5% 77
 77a. bittercherry (PREM) present; coverage equals or exceeds 10%
 PREM (p. 227)
 77b. bittercherry absent or with coverage less than 10% 78
 78a. mountain snowberry (SYOR2) present; coverage equals or exceeds 5% SYOR2 (p. 226)
 78b. common juniper (JUCO6) present; coverage equals or exceeds 5% JUCO6 (p. 227)

Key to Subalpine Grasslands and Sedgelands

- 79a. green fescue present with coverage equal to or exceeding 5% 80
 79b. green fescue absent or with coverage less than 5% 89
 80a. green fescue with sedges as the dominant associated herbaceous plant at 10% coverage or greater 81
 80b. green fescue with other herbaceous plants associated 83
 81a. Holm's Rocky Mountain sedge (CASC12) present; coverage equals or exceeds 10%
 FEVI/CASC12 (p. 257)
 81b. Holm's Rocky Mountain sedge absent or coverage less than 10% 82
 82a. Ross' sedge (CARO5) present; coverage equals or exceeds 10% FEVI-CARO5 (p. 242)
 82b. Hood's sedge (CAHO5) present; coverage equals or exceeds 10% FEVI-CAHO5 (p. 245)
 83a. green fescue, rushes, and other grasses associated; rush or other grass coverage greater than 5% 84
 83b. green fescue associated with rushes and other grasses at less than 5% coverage; or they are absent 86
 84a. Parry's rush (JUPA) present with coverage equal to or exceeding 5% FEVI-JUPA (see p. 238)
 84b. Parry's rush absent or with coverage less than 5% 85
 85a. bearded wheatgrass (AGCA2) coverage greater than 5% FEVI-AGCA2 (see p. 256)
 85b. western needlegrass (STOC) coverage greater than 5% FEVI-STOC (see p. 252)
 86a. green fescue dominant with herbaceous forbs absent (or present at less than 5% coverage each)
 FEVI (see p. 230)
 86b. green fescue associated with herbaceous forbs; coverage of some forb species exceed 5% coverage 87
 87a. lupines (LUPIN) present; coverage equals or exceeds 10% FEVI-LULA3 (p. 234)
 87b. lupines absent or coverage is less than 10% 88
 88a. penstemons (PENST) present with coverage equal to or exceeding 10% FEVI-PENST (p. 248)
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 89a. Hood's sedge present with coverage equal to or exceeding 5% 90
 90a. Hood's sedge (CAHO5) prominent on colluvial slopes and avalanche sites 91a, b, c, d
 91a. mountain brome (BRCA5) associated CAHO5-BRCA5 (p. 187)
 91b. elk sedge (CAGE2) associated CAHO5-CAGE2 (p. 190)
 91c. sticky cinquefoil (POGL9) associated CAHO5-POGL9 (p. 190)
 91d. Idaho fescue (FEID) associated FEID-CAHO5 (p. 269)

90b. Hood's sedge (CAHO5) present in meadows CAHO5-BRCA5 meadow (p. 283)		103a. Other grasses present at coverage greater than 5%	104
89b. Hood's sedge absent; or with coverage less than 5%	92	104a. oniongrass (MEBU) present at a coverage of 5% or greater	MEBU-STOC (p. 278)
92a. elk sedge present with coverage equal to or exceeding 5%	93a, b, c, d, e, f	104b. oniongrass absent or present at less than 5%	105
92b. elk sedge absent; or with coverage less than 5%	94	105a. Sandberg's bluegrass (POSA12) present at a coverage of 5% or greater	POSA12-SELA (p. 279)
93a. pinegrass (CARU) present with coverage equal to or exceeding 5%	CAGE2-CARU (p. 281)	105b. Sandberg's bluegrass absent or present at less than 5% cover	106
93b. Idaho fescue (FEID) present with coverage equal to or exceeding 5%	CAGE2-FEID (p. 280)	106a. western needlegrass (STOC) present at a coverage of 5% or greater	STOC-SIHY (p. 278)
93c. Cusick's bluegrass (POCU3) with coverage equal to or exceeding 5%	CAGE2-POCU3 (p. 281)	106b. western needlegrass absent or with coverage less than 5%	103b.
93d. Parry's rush (JUPA) with coverage equal to or exceeding 5%	CAGE2-JUPA (p. 281)	103b. grasses absent or present with coverage less than 5%	108
93e. desert phlox (PHAU3) with coverage equal to or exceeding 5%	CAGE2-PHAU3 (p. 282)	108a. Parry's rush (JUPA) present at 5% coverage or greater	JUPA-AGGL (p. 285)
93f. western needlegrass (STOC) with coverage equal to or exceeding 5%	CAGE2-STOC (p. 282)	108b. Parry's rush absent or with coverage less than 5%	109
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95b. western needlegrass (STOC) associated	CAREX-STOC (p.282)	110b. horsemint (AGUR) associated	POPH-AGUR-LINU4 (p. 184)
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98a. prairie junegrass (KOCR) present with coverage equal to or exceeding 1%	FEID-KOCR (high) (p. 261)	112a. shrubby cinquefoil (POFR4) prominent at 10% coverage or more	POFR4 (p. 182)
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¹ *pa* = plant association; *pct* = plant community type; *comm.* = community

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Mountain Hemlock/Grouse Huckleberry Plant Association
Tsuga mertensiana/Vaccinium scoparium (TSME/VASC)



Fox Point, Eagle Cap Wilderness, Wallowa Mountains Plot 6224

Distribution - Wallowa Mountains. Prominent on the northern ridges (Huckleberry Mountain, Big Sheep Ridge, Jim White Ridge, Washboard Ridge, Cartwheel Ridge, and Fox Point).

Environmental features - On northerly exposures of broad ridgetops, coves, basins, and steep slopes. High precipitation, cold temperatures, deep snowpacks lasting late into summer promote hemlock. Subalpine stands ranged from 6,760 to 7,320 ft in elevation. All plots on basalts at ridgetop and upper slope positions.

Soils - Soils have a thick volcanic ash mantle and moderate to high available water capacity. Profiles consist of volcanic ash with silt loam texture (13 to 20 inches deep), over mixed ash and colluvium or weathered bedrock with gravelly or very gravelly silt loam to loam textures (36 to 41 inches deep), over bedrock. (N = 3)

Vegetation composition - Mountain hemlock trees dominated the overstory canopy almost to the exclusion of other tree species. Forest understory was dominated by seedlings and saplings of mountain hemlock. Subalpine fir was associated in canopy gaps. The understory is often deficient in light. Therefore, shrub and herbaceous vegetation was usually present at less than 5% cover. Grouse huckleberry was usually present unless lack of light precluded it. Utah honeysuckle, Ross' sedge, heartleaf arnica, and roundleaved violet were commonly present. Sampled late seral mountain hemlock stands averaged 273 years (257 to 305 years).

Successional relationships - In stand-replacement burns, lodgepole pine often pioneers. Grouse huckleberry is frost tolerant and has its highest cover in early to mid seral stands. In mid seral stands, Engelmann spruce and subalpine fir are stronger associates than at late seral stages. Succession advances very slowly owing to the short growing season, deep lingering snows, and cold temperatures.

Disturbance ecology - Late seral mountain hemlock stands survive low-frequency, high-severity fires owing to their high humidity and thick bark of the old-growth trees. Fire suppression has favored the expansion of stands in the high subalpine. The stands occurring on gentle topography are vulnerable to stand-replacement burns with lodgepole pine favored following the burn. Little browse or forage is available to deer, elk, or goats. The cool, dark stands offer thermal and diurnal cover for shading animals.

Relationship to other studies - Mountain hemlock communities have been studied extensively in the Cascade and Olympic Mountains where they are prominent (Franklin 1966, Hemstrom et al. 1982, Brockway et al. 1983, Henderson 1984, Atzet et al. 1996). Mountain hemlock also forms communities in the Northern Rocky Mountains where it was classified by Daubenmire (1968), Pfister et al. (1977), and Cooper et al. (1991). Volland (1976) and Hopkins (1979b) first typified TSME/VASC in the Klamath and eastern Cascade Mountains of south-central Oregon. The mountain hemlock/grouse huckleberry plant association was previously classified in the subalpine of the Wallowas by Johnson and Simon (1987).

Miscellany - *Polytrichadelphus lyallii* and *Minium blyttii* were prominent among the mosses identified in these communities. Burls were frequent on older trees. They are a result of ice crystallization opening wounds in the cambial layer. Gall-forming bacteria enter the wound to infect the bole and form the burl.

Table of Environmental Features

TSME/VASC (n = 7)	MEAN	RANGE
Elevation (ft)	7,016	6,760-7,320
Slope (%)	31	10-65
Soil available water capacity (inches)		7-9 (moderate to high)
Depth to bedrock (inches)		More than 28
Stand age (years)	273	257-305
Aspect (no. of plots)	NW 5 NE 0 SE 1 SW 1	
Geology	Basalt	
Position	Ridgetop, upper 1/3	
Relief	Convex, flat, concave	

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
mountain hemlock	TSME	59	100	45-90
Engelmann spruce	PIEN	5	14	0-5
subalpine fir	ABLA	3	14	0-3
lodgepole pine	PICO	3	14	0-3
Tree Understory				
mountain hemlock	TSME	16	100	2-35
subalpine fir	ABLA	5	71	0-6
Shrubs				
grouse huckleberry	VASC	7	86	0-15
Utah honeysuckle	LOUT2	1	71	0-1
Sedges				
Ross' sedge	CARO5	2	57	0-5
elk sedge	CAGE2	1	43	0-1
Forbs				
heartleaf arnica	ARCO9	2	57	0-5
white-flowered hawkweed	HIAL	3	29	0-5
round-leaved violet	VIOR	2	43	0-5

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	1	57	0-1
Rock	1	71	0-3
Gravel	2	71	0-10
Moss	6	100	1-15
Lichen	1	57	0-1
Litter	89	100	80-99

Mountain Hemlock/Big Huckleberry Plant Association
Tsuga mertensiana/Vaccinium membranaceum (TSME/VAME)



Indian Creek Research Natural Area, La Grande Ranger District,
 Wallowa Mountains Plot 1342

Distribution - Wallowa Mountains. Prominent on the northwest flank from Moss Springs to Dunn's Bluff and in Indian Creek Basin.

Environmental features - Usually restricted to northerly exposures on foliated basalt. Found on steep upper slopes, ridgetops, and in cove settings near ridgetops and adjacent to basins. The type persists owing to high levels of precipitation, cold temperatures, and deep snowpacks lasting into mid summer. The subalpine stands range from 5,930 to 6,720 ft in elevation. Slopes averaged 39% with sites ranging from 15% to 90%.

Soils - Soils have a thick ash mantle and high available water capacity. Profiles consist of an organic surface horizon about 2 inches thick overlying thick, volcanic ash with silt loam or gravelly silt loam texture. Weathered bedrock underlies the ash at a depth usually beyond our sampling depth (generally more than 3 ft). (N=4).

Vegetation composition - Mountain hemlock dominated the tree overstory canopy with coverage as high as 70%. Associated with it was subalpine fir. The tree understories were codominated by mountain hemlock and subalpine fir. These sites are warmer than TSME/VASC sites as reflected by the presence of big huckleberry with the fir. Utah honeysuckle was the only other shrub regularly associated. Owing to the dense tree canopy coverage, herbaceous vegetation was scant. Only Ross' sedge and skunk-leaved polemonium were regularly present. Hemlock stands averaged 248 years (220 to 300 years). Fringed pinesap (*Hypopitys monotropa*) occurs in August in these communities.

Successional relationships - Engelmann spruce and subalpine fir occur as succeeding species in canopy gaps within the hemlock stands. Historically, fire has discriminated against the fir. Succession advances slowly owing to the short growing season, deep snow loading, and cold temperatures.

Disturbance ecology - These late seral stands have survived infrequent fires owing to high humidity levels and the thick bark of veteran trees. Stand-replacing fires would favor lodgepole pine establishment. Little browse or forage is available. Elk and deer use these stands for thermal and diurnal cover.

Relationship to other studies - The TSME/VAME plant association has been defined by Brockway et al. (1983) and Henderson (1984) in the Cascade and Olympic Mountains, for the east slopes of the Cascades on the Wenatchee National Forest (Lillybridge et al. 1995), and in the subalpine of the Wallawas by Johnson and Simon (1987).

Table of Environmental Features

TSME/VAME (n = 5)

	MEAN		RANGE	
Elevation (ft)	6,506		5,930-6,720	
Slope (%)	39		15-90	
Soil available water capacity (inches)			11-14 (high)	
Depth to bedrock (inches)			More than 28	
Stand age (years)	248		220-300	
Aspect (no. of plots)	NW 3	NE 2	SE 0	SW 0
Geology	Basalt, granodiorite			
Position	Ridgetop, upper 1/3, cove			
Relief	Convex, concave, straight, undulating			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
mountain hemlock	TSME	59	100	50-70
subalpine fir	ABLA	6	40	0-10
Tree Understory				
mountain hemlock	TSME	7	100	4-10
subalpine fir	ABLA	8	80	0-20
Engelmann spruce	PIEN	4	20	0-4
Shrubs				
big huckleberry	VAME	3	100	1-5
grouse huckleberry	VASC	2	80	0-3
Utah honeysuckle	LOUT2	4	60	0-10
Herbs				
Ross' sedge	CARO5	1	60	0-1
skunk-leaved polemonium	POPU3	2	40	0-3

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	1	60	0-1
Rock	5	60	0-40
Gravel	2	60	0-5
Moss	12	100	3-30
Lichen	1	20	0-1
Litter	77	100	30-95

Limber Pine/Mountain Juniper Plant Community Type
***Pinus flexilis/Juniperus communis* var. *montana* (PIFL2/JUCO6)**



Ridge above the South Fork of Middle Fork of North Fork Imnaha River, Eagle Cap Wilderness, Wallowa Mountains Plot 6275

Distribution - Wallowa Mountains (Hurricane Creek Canyon; Middle Fork and North Fork Imnaha Canyons).

Environmental features - Restricted to marine sedimentary substrates of Martin Bridge Formation (Walker 1979) on limestone and marble. Often on steep mountainous slopes at lower slope positions on ridgelets and outcroppings where the community is secure from slope movement (scree) and avalanches. Elevations ranged from 6,000 to 7,780 ft (mean = 6,687 ft). Slopes were steep (avg. 57%). Sites were on southerly and northerly aspects.

Vegetation composition - Limber pines dominated the overstory. In the Hurricane Creek Canyon, Rocky Mountain juniper is a strong associate and has advanced from the Wallowa Valley via the limestone formation. In the upper middle and north forks of the Imnaha, the Rocky Mountain juniper is absent. However, common juniper is strongly associated with limber pine in both places. Other shrubs of note in these communities are creeping Oregon-grape, mountain snowberry, and buffaloberry. Herbaceous plants commonly present are bottlebrush squirreltail, pinegrass, meadowrue, and western false Solomon's seal.

Successional relationships - Uncertain. The sites sampled were all in relict, late seral communities.

Disturbance ecology - These old growth-dominated stands have survived fires and avalanches as a result of their location on ridgelets and outcroppings. Principal ungulate use is by deer. Deer beds were found in sheltered locations behind common juniper thickets or beneath the limber pine veteran.

Relationship to other studies - Limber pine is principally a Rocky Mountain species most prominent in the central and southern Rockies. Ecologists classifying in Idaho and Montana provided the first descriptions of PIFL2/JUCO2. In Montana, Pfister et al. (1977) described it from the Pryor and Beartooth Mountains where it was restricted to limestone. Steele et al. (1981) found the type in the Lost River and Lemhi Mountains of east central Idaho on southerly to westerly exposures on calcareous substrates. PIFL2/JUCO2 was found in eastern Idaho (Steele et al. 1983) where buffaloberry often occurred with common juniper on limestone and calcareous sandstones. This plant community type was not previously described in northeastern Oregon.

Miscellany - Ages of two-cored trees in South Fork of Middle Fork of Imnaha River Canyon were estimated at 750 and 2,030 years, respectively. Limber pines and whitebark pines growing in subalpine environments constitute the oldest living trees in northeastern Oregon.

Table of Environmental Features
PIFL2/JUCO6 (n = 3)

	MEAN		RANGE	
Elevation (ft)	6,687		6,000-7,780	
Slope (%)	57		40-65	
Aspect (no. of plots)	NW 1	NE 0	SE 1	SW 1
Geology	Limestone			
Position	Lower 1/3, upper 1/3			
Relief	Convex, concave			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
limber pine	PIFL2	35	100	5-80
Rocky Mountain juniper	JUSC2	6	67	0-10
Tree Understory				
Rocky Mountain juniper	JUSC2	28	67	0-30
limber pine	PIFL2	1	33	0-1
Shrubs				
common juniper	JUCO6	13	100	5-30
creeping Oregon-grape	BERE	8	67	0-15
mountain snowberry	SYOR2	10	33	0-10
buffaloberry	SHCA	4	67	0-5
Grasses				
pinegrass	CARU	35	33	0-35
bottlebrush squirreltail	SIHY	1	67	0-1
Forbs				
heartleaf arnica	ARCO9	10	33	0-10
meadowrue	THOC	3	67	0-5
aster	ASTER	8	67	0-10
western false Solomon's seal	SMRA	2	67	0-3

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	11	100	3-25
Rock	7	100	1-15
Gravel	5	66	0-15
Moss	1	33	0-1
Lichen	0	0	0
Litter	68	100	50-90

Whitebark Pine/Mountain Gooseberry/Skunk-leaved Polemonium Plant Association *Pinus albicaulis/Ribes montigenum/Polemonium pulcherrimum* (PIAL/RIMO2/POPU3)



Hurwal Divide, Eagle Cap Wilderness, Wallowa Mountains Plot 6144

Distribution - Wallowa, Seven Devils, Elkhorn, and Strawberry Mountains.

Environmental features - Found on granitic, basaltic, metabasaltic and limestones. This type is widespread on southerly aspects; moderate to steep slopes ranging from 8,000 to 8,600 ft elevation. It occurs on convex to undulating topography at mid to lower slope positions as well as on ridgetops.

Soils - Our sole soil sample consisted of extremely stony silt loam over bedrock at a depth of 41 inches. Available water capacity was low (about 2.5 inches) and pH relatively low (mostly 5.3 to 6.2; 4.3 in the thin A horizon).

Vegetation composition - Whitebark pine tends to be free of subalpine fir above 8,000 ft elevation. Subalpine fir are minor opportunists on these sites with little chance for long-term establishment. Mountain gooseberry is prominent and defines the type along with skunk-leaved polemonium. Graminoides often present are Ross' sedge and western needlegrass. Forbs notably a part of this type are skunk-leaved polemonium, heartleaf and hairy arnica, lupines, and yarrow. Whitebark pines sampled ranged from 110 to 225 years old. This type was found with Krummholz structure at high elevation owing to high wind shear and ice formation.

Successional relationships - No other tree species can persist on these whitebark pine potential sites.

Disturbance ecology - Deer use these communities heavily for bedding and hiding. Elk are also frequent users of these communities. Patches of yarrow define old bedding areas. Pocket gophers had made abundant upwellings on open areas in several communities pertaining to this type.

Relationship to other studies - Pfister et al. (1977) and Steele et al. (1975, 1981) did not describe whitebark pine/mountain gooseberry habitat types in the northern Rocky Mountains. Subalpine fir was coclimax with whitebark pine in their classifications of types containing mountain gooseberry. This plant association has not been previously described for northeast Oregon.

Table of Environmental Features
PIAL/RIMO2/POPU3 (n = 9)

	MEAN		RANGE	
Elevation (ft)	8,320		7,930-9,070	
Slope (%)	45		30-70	
Stand Age (years)	180		110-225	
Aspect (no. of plots)	NW 0	NE 0	SE 1	SW 8
Geology	Granitic, limestone, and basalt			
Position	Ridgetops, mid and lower slopes			
Relief	Convex, undulating			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
whitebark pine	PIAL	34	34	10-50
Tree Understory				
whitebark pine	PIAL	8	8	3-23
subalpine fir	ABLA	3	3	0-5
Shrubs				
mountain gooseberry	RIMO2	11	11	1-30
Grasses				
western needlegrass	STOC	1	1	0-5
bottlebrush squirreltail	SIHY	1	1	0-1
mountain brome	BRCA5	1	1	0-5
Grasslikes				
Ross' sedge	CARO5	3	3	0-15
elk sedge	CAGE2	2	2	0-15
Forbs				
arnicas	ARNICA	5	5	0-30
skunk-leaved polemonium	POPU3	23	23	5-65
Sitka valerian	VASI	1	1	0-10
yarrow	ACMIL	1	1	0-3
lupines	LUPIN	14	14	0-30
thick leaved groundsel	SECR	4	4	0-20

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	3	89	0-10
Rock	20	89	0-65
Gravel	9	78	0-40
Moss	0	0	
Lichen	0	0	
Litter	57	100	35-90

Whitebark Pine/Grouse Huckleberry/Smooth Woodrush Plant Association

Pinus albicaulis/Vaccinium scoparium/Luzula hitchcockii
(PIAL/VASC/LUHI4)



Heavens Gate, Seven Devils Mountains Plot 7038

Distribution - Seven Devils.

Environmental features - Found on metavolcanics (greenstone, andesite) in the Seven Devils from 8,000 to 8,500 ft elevation. Sites were located on ridgetops and moderate upper slopes on convex, concave, and undulating surfaces. The sites are rocky, often with bedrock exposures, and located where snowpacks persist late in the growing season.

Soils - Our sole sample consisted of extremely stony to cobbly loam or sandy loam over bedrock at 38 inches depth. Available water capacity was low to very low (about 2 inches), and pH relatively low (mostly 5.0 to 6.1; 4.0 in the very thin A horizon).

Vegetation composition - Whitebark pine dominates the tree overstory layers. Engelmann spruce is common in the overstory. Tree understory layers were often codominated by whitebark pine and Engelmann spruce. Subalpine fir, if present, is considered a short-term opportunist on these sites. Understories were dominated by smooth woodrush often in association with grouse huckleberry. Parry's rush and Ross' sedge were frequently found. Skunk-leaved polemonium was always prominent under tree crowns. Prickly sandwort occupies openings within the stands.

Successional relationships - These sites are too harsh (cold, windy) for true fir establishment. Only Engelmann spruce is capable of long-term survival with the pines. Woodrush favors coves and concavities. Parry's rush, grouse huckleberry, parrot's beak, and prickly sandwort favor the convex rocky exposed surfaces.

Disturbance ecology - Little used by ungulates. On moderate slopes, tailcup lupine, alpine daisy, leafy aster, and thick-leaved groundsel all increase with disturbances to the site. On steeper slopes, alpine knotweed increases with surface disturbance. These stands are infrequently visited by fire.

Relationship to other studies - Pfister et al. (1977), Steele et al. (1981), Cooper, et al. (1991), and Lillybridge et al. (1995) all described subalpine fir/smooth woodrush vegetation. Whitebark pine was associated. On the east slopes of the Cascades, Lillybridge et al. (1995) described a PIAL/VASC/LUHI4 plant association, which was similar to the vegetation in the Seven Devils except for low coverages by mountain hemlock, Douglas-fir, and low huckleberry. This plant association has not been previously described in northeast Oregon or adjacent Idaho (Seven Devils).

Table of Environmental Features
PIAL/VASC/LUHI4 (n = 4)

	MEAN		RANGE	
Elevation (ft)	8,143		7,980-8,480	
Slope (%)	30		25-40	
Aspect (no. of plots)	NW 2	NE 2	SE 0	SW 0
Geology	Metavolcanics			
Position	Ridgetop, upper 1/3 slope			
Relief	Convex, concave, undulating			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
whitebark pine	PIAL	36	100	25-55
Engelmann spruce	PIEN	3	50	0-5
subalpine fir	ABLA	3	25	0-3
Tree Understory				
whitebark pine	PIAL	14	75	0-33
Engelmann spruce	PIEN	16	50	0-30
subalpine fir	ABLA	2	50	0-3
Shrubs				
grouse huckleberry	VASC	28	75	0-50
pink mountain heath	PHEM	1	50	0-1
Grasslikes				
Smooth woodrush	LUHI4	38	100	10-95
Parry's rush	JUPA	10	75	0-15
elk sedge	CAGE2	1	50	0-1
Ross' sedge	CARO5	5	75	0-10
Forbs				
skunk-leaved polemonium	POPU3	5	100	1-10
prickly sandwort	ARAC2	1	75	0-1
tailcup lupine	LUCA	25	50	0-40
thick-leaved groundsel	SECR	2	75	0-5
coiled parrot's beak	PECO	15	25	0-15
leafy aster	ASFO	10	25	0-10
alpine daisy	ERPE3	1	50	0-1

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	2	50	0-5
Rock	23	100	1-30
Gravel	2	75	0-5
Moss	1	75	0-3
Lichen	0	0	0
Litter	64	100	25-95

Whitebark Pine/Green Fescue Plant Association
Pinus albicaulis/Festuca viridula (PIAL/FEVI)



Above Little Eagle Meadows, Eagle Cap Wilderness, Wallowa Mountains
 Plot 6144

Distribution - Wallowa Mountains.

Environmental features - Occurs at relatively low elevations (mean was 7,760 ft) in the subalpine of the Wallawas on basaltic and granitic substrates. It was found on southwesterly aspects on ridgetops; moderate upper and lower slopes.

Soils - Our sole soil sample consisted of gravelly and very gravelly loamy coarse sand over bedrock at 22 inches. Available water capacity was very low (about 1 inch) and pH relatively low (5.6 to 6.0). This droughty soil is typical of whitebark pine sites and drier than most green fescue-dominated sites.

Vegetation composition - Whitebark pine provided the only tree canopy in the overstory. It was also the dominant tree in the understory. Subalpine fir occurred only as an occasional understory member. Green fescue provided the prominent herbaceous vegetation in these stands. Needlegrass and squirreltail were usually present with Parry's rush in the interspaces between fescue clumps. Forbs consistently present were prickly sandwort, linanthastrum, lupine, and fleecflower. Whitebark pine stand ages from sample plots ranged from 172 to 248 years.

Successional relationships - Whitebark pine is the only tree species capable of establishment on these sites. Linanthastrum increases with disturbance. It does not outcompete fescue on concavities - only on convexities. Fire historically has underburned these communities promoting fescue and pine regeneration and dominance. The type is characterized by open woodland, savannah, and tree islands dominated by whitebark pine veterans.

Disturbance ecology - Avalanches and soil erosion from snowmelt promotes fleecflower. Ungulate overgrazing has permitted linanthastrum and lupines to increase. Needlegrass also increases following ungulate overgrazing.

Relationship to other studies - Lillybridge et al. (1995) described this plant association on the Wenatchee National Forest and referred to similar vegetation on the Okanogan National Forest. This plant association was not described previously for northeast Oregon.

Table of Environmental Features
PIAL/FEVI (n = 3)

	MEAN	RANGE
Elevation (ft)	7,763	7,480-7,910
Slope (%)	37	25-45
Soil available water capacity (inches)		11-14 (high)
Stand age (years)	248	
Aspect (no. of plots)	NW 0 NE 0 SE 0 SW 3	
Geology	Basalt, granite	
Position	Ridgetop, upper and lower slopes	
Relief	Convex, concave	

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
whitebark pine	PIAL	43	100	40-45
Tree Understory				
whitebark pine	PIAL	8	67	0-10
subalpine fir	ABLA	1	67	0-1
Grasses				
green fescue	FEVI	19	100	3-30
bottlebrush squirreltail	SIHY	2	67	0-3
needlegrass	STIPA	8	100	1-20
Grasslikes				
Parry's rush	JUPA	3	67	0-5
Forbs				
prickly sandwort	ARAC2	10	67	0-10
fleecflower	POPH	1	67	0-1
linanthastrum	LINU4	10	67	0-15
lupine	LUPIN	8	67	0-15

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	5	100	3-10
Rock	8	100	1-20
Gravel	10	67	0-15
Moss	1	33	0-1
Lichen	0	0	0
Litter	62	100	55-70

Whitebark Pine/Elk Sedge Plant Association
***Pinus albicaulis/Carex geyeri* (PIAL/CAGE2)**



Elkhorn Peak, Elkhorn Mountains Plot 8505

Distribution - Elkhorn and Strawberry Mountains.

Environmental features - This type is common in the subalpine of the Blue Mountains; an ecologic equivalent to whitebark pine/green fescue in the Wallowa Mountains. This type was found at elevations ranging from 7,800 to 8,800 ft elevation on granitic, andesitic and argillitic soils. All sampled sites were on gentle to steep ridgetop locations with southerly aspects. Relief was flat, convex to undulating. Sites tended to be rocky with gravelly soils.

Vegetation composition - Whitebark pine old growth dominated tree overstories. Lodgepole pine was decadent in late seral stands. Tree undergrowth was dominated by whitebark pine. Lodgepole pine and subalpine fir were present at low coverages but were considered ephemeral. Both elk sedge and Ross' sedge provided mats of herbaceous growth in the understory. Wheeler's bluegrass and polemonium were omnipresent in the litter beneath the whitebark crowns. In the clearings within the stand, prickly sandwort, desert phlox, and western needlegrass frequently were found.

Successional relationships - These sites are too harsh for sustaining subalpine fir. Most sites were on steep colluvium with southerly aspects on the windward side of ridges. The shearing winds, ice storms, and high solar radiation are lethal to true fir.

Disturbance ecology - In the Elkhorn Mountains these communities are used heavily by mountain goats and deer. In the Strawberry Range, these communities were used for shelter and bedding by deer and elk. Yarrow, fleecflower, and thick-leaved groundsel define areas of past trampling and bedding disturbance.

Relationship to other studies - Steele et al. (1983) described a PIAL/CAGE2 habitat type in Yellowstone National Park and adjacent Idaho. As in stands of the Strawberry Mountains, lodgepole pine successfully established as a seral dominant in the PIAL/CAGE2 habitat type of the Rocky Mountains.

Table of Environmental Features
PIAL/CAGE2 (n = 4)

	MEAN		RANGE	
Elevation (ft)	8,173		7,770-8,810	
Slope %	31		5-50	
Aspect (no. of plots)	NW 0	NE 0	SE 1	SW 3
Geology	Granidiorite, andesite, argillite			
Position	Ridgetops			
Relief	Convex, flat, undulating			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
whitebark pine	PIAL	25	100	20-30
lodgepole pine	PICO	10	50	0-10
Tree Understory				
whitebark pine	PIAL	12	100	3-16
subalpine fir	ABLA	3	50	0-5
lodgepole pine	PICO	6	50	0-6
Grasses				
western needlegrass	STOC	13	50	0-20
bottlebrush squirreltail	SIHY	1	50	0-1
Wheeler's bluegrass	PONEW	3	100	1-10
Grasslikes				
Ross' sedge	CARO5	6	75	0-15
elk sedge	CAGE2	6	100	3-10
Forbs				
skunk-leaved polemonium	POPU3	2	75	0-5
yarrow	ACMIL	2	100	1-5
prickly sandwort	ARAC2	3	75	0-5
fleeceflower	POPH	20	25	0-20
hawkweeds	HIERA	7	50	0-10
thick-leaved groundsel	SECR	5	50	0-10
desert phlox	PHAU3	3	50	0-5

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	3	100	1-5
Rock	21	100	5-60
Gravel	12	100	1-25
Moss	0	0	
Lichen	0	0	
Litter	60	100	36-80

Whitebark Pine/Prickly Sandwort Plant Community Type
Pinus albicaulis/Arenaria aculeata (PIAL/ARAC2)



Strawberry Mountain Research Natural Area (proposed)
 Strawberry Mountains Plot 8886

Distribution - Elkhorn and Strawberry Mountains.

Environmental features - Found at the highest elevations (8,540 to 9,040 ft) in the Strawberry and Elkhorn Mountains. The sites in the Strawberries were on moderate slopes along ridges of andesite, where it occurred on convex surfaces. This type occurred near the summit of Rock Creek Butte on a southwest steep slope consisting of argillite.

Soils - Soils are droughty, coarse-grained, and relatively acid similar to other whitebark pine sites. Soil profiles consist of a thin organic surface horizon up to 2 inches thick (may be absent) over very or extremely gravelly silt loam, loam, sandy loam, or loamy sand. Bedrock is present at 28 to 43 inches deep. (N = 3).

Vegetation composition - Whitebark pine dominated all tree canopy layers. Subalpine fir was absent or incidental. Wheeler's bluegrass was consistent beneath tree crowns. Ross' sedge was often present. The open rocky - gravelly slopes were dominated by prickly sandwort. Other notable forbs were phlox, pussy paws, whiteleaf phacelia, sickletop lousewort, and Gray's licoriceroot. Trees were stunted (15 to 20 ft tall) in a "pygmy forest" with one age class dominating (tree ages were 92 to 263 years).

Successional relationships - Whitebark pine is the only tree species able to persist on these harsh sites.

Disturbance ecology - Fire is rare in this community type. Elk, deer, and mountain goat use these communities for hiding and bedding.

Relationship to other studies - This plant community type has not been previously described.

Table of Environmental Features
PIAL/ARAC2 (n = 3)

	MEAN		RANGE	
Elevation (ft)	8,590		8,540-9,040	
Slope (%)	30		15-50	
Soil pH			5.0 to 6.5	
Soil available water capacity (inches)			2-3 (low)	
Depth to bedrock (inches)			28-43	
Stand age (years)	248		220-300	
Aspect (no. of plots)	NW 1	NE 0	SE 1	SW 1
Geology	Andesite, argillite			
Position	Ridgetop, upper 1/3			
Relief	Convex			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
whitebark pine	PIAL	31	100	25-43
Tree Understory				
whitebark pine	PIAL	9	67	0-15
subalpine fir	ABLA	1	67	0-1
lodgepole pine	PICO	1	33	0-1
Grasses				
Wheeler's bluegrass	PONEW	3	100	1-5
Letterman's needlegrass	STLE4	15	33	0-15
Grasslikes				
Ross' sedge	CARO5	1	67	0-1
elk sedge	CAGE2	3	33	0-3
Forbs				
prickly sandwort	ARAC2	17	100	10-20
Gray's Licorice-root	LIGR	5	33	0-5
leafy lousewort	PERA	5	33	0-5
white leaf phacelia	PHHA	5	33	0-5
umbellate pussypaws	SPUM	1	67	0-1
phlox	PHLOX	4	67	0-5

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	6	100	1-15
Rock	17	100	15-20
Gravel	20	100	5-30
Moss	1	33	0-1
Lichen	1	33	0-1
Litter	48	100	20-75

WHITEBARK PINE COMMUNITIES

Whitebark Pine/Grouse Huckleberry/Heartleaf Arnica Community

Pinus albicaulis/Vaccinium scoparium/Arnica cordifolia
(PIAL/VASC/ARCO9) (n = 1)

The plant community occurred on quartz diorite outcrops in the Elkhorn Mountains. Whitebark pine dominated all tree layers. Engelmann spruce and subalpine fir were present in only trace amounts as saplings. Grouse huckleberry and heartleaf arnica formed patches beneath the tree crowns. The rocky ground away from tree crown protection contained prickly sandwort. Fleeceflower entered the stand from adjacent nonforested slopes. Deer actively grazed the succulent fleeceflower foliage. Granitic outcrops accounted for 20% of the total rock cover of 30%. Slope relief was 84%. The soil consisted of very and extremely cobbly and stony sandy loam over bedrock at 46 inches depth, with pH of 6.2 to 6.5 and low available water capacity.

Whitebark Pine/Grouse Huckleberry/Prickly Sandwort Community

Pinus albicaulis/Vaccinium scoparium/Arenaria aculeata
(PIAL/VASC/ARAC2) (n = 1)

The plant community was found on quartz diorite outcrops in the Elkhorn Mountains. Whitebark pine was the only tree species capable of persisting on the dry, cold, windy site. Grouse huckleberry and skunk-leaved polemonium formed patches beneath the tree crowns. The rocky-gravelly portion of the stand was occupied by scattered prickly sandwort, phlox, and fleeceflower. Granitic outcroppings contained sulfur penstemon, lanceleaved stonecrop, brittle bladder fern, and gooseberry-leaved alumroot. Tree age was 270 years. Granitic outcrops constituted 20% of the 45% rock cover on the site. Slope relief was 80%. The soil consisted of extremely bouldery sandy loam over bedrock at 19 inches deep, with pH of 6.0 to 6.3 and very low available water capacity.

Whitebark Pine/Silvery Lupine Community

Pinus albicaulis/Lupinus argenteus (PIAL/LUAR3) (n = 1)

This community occupies the "popcorn" granitic gravels called *grus*. These are extremely harsh sites with high exposure to desiccating winds. The only tree species that can survive on these sites is whitebark pine. Tree age was 245 years. Herbaceous plants associated on the *grus* were few and scant. Dominating was silvery lupine (*Lupinus argenteus*). Other plants occupying the site were prickly sandwort, Ross' sedge, fleeceflower, and Cusick's bluegrass.

Whitebark Pine/Mountain Juniper - Pinemat Manzanita Community

Pinus albicaulis/Juniperus communis var. montana -
Arctostaphylos nevadensis (PIAL/JUCO6-ARNE) (n = 2)

This plant community was found on gabbro near the summit of Canyon Mountain in the Strawberry Mountains. At lower elevations on gabbro, subalpine fir is associated with common juniper and manzanita. Whitebark pine is the only tree species capable of surviving the harsh environmental conditions. Trees were stunted, often prostrate and strongly bannered from high winds and ice shearing. Trees were less than 15 ft tall with diameters of 18 to 24 inches. One tree was 346 years old. The shrubs, common juniper, and pinemat manzanita were dominant in patches within the stand. Bedrock, rock, and gravel accounted for 70% of the plot area. The primary forbs were prickly sandwort, Ross' sedge, needlegrass, and Wheeler's bluegrass. The trees were free of disease or insect problems. *Cymopterus nivalis* appeared to have an affinity for this type.

Subalpine Fir-Whitebark Pine/Mountain Gooseberry/Skunk-leaved Polemonium Plant Community Type
Abies lasiocarpa-*Pinus albicaulis*/*Ribes montigenum*/
Polemonium pulcherrimum (ABLA-PIAL/RIMO2/POPU3)



Elkhorn Crest near Sardine Gulch, Elkhorn Mountains Plot 8516

Distribution - Wallowa and Elkhorn Mountains.

Environmental features - Found on intrusive rocks (quartz diorite) and metamorphic rocks (argillite) at moderate elevations (7,600-8,000 ft) on moderate slopes (mean = 33%). The type occurs on rolling topography from ridgetop locations to lower slopes.

Soils - The two soil profiles studied were coarse-grained, droughty and rather acidic, formed in residuum over bedrock. Profiles consisted of a thin (1-inch) O or A horizon over very to extremely gravelly or cobbly silt loam, loam, or sandy loam. Bedrock was present at 37 and 46 inches in the two profiles, with pH values of 5.0 to 6.0 and low to moderate available water capacity (2 to 5 inches). (N = 2).

Vegetation composition - Whitebark pine dominated the tree overstory canopy layers with subalpine fir dominating the understory tree layer. The two tree species are treated as coclimax members. Mountain gooseberry was consistently present as was skunk-leaved polemonium. Other herbaceous plants prevalent in these communities were Ross' sedge, Sitka valerian, prickly sandwort, and either heartleaf or hairy arnica.

Successional relationships - Ages of sampled trees show whitebark averaging 195 years and subalpine fir younger at 73 years. The retardation of fire in these stands has enabled subalpine fir to codominate in some overstories and to dominate in understories. With regular fire-return intervals, whitebark pine would dominate overstory and understory tree layers.

Disturbance ecology - Fire-return intervals of 30 to 50 years (Arno 1980, 1986; Morgan and Bunting 1990) could be expected in this low-elevation subalpine type. Regular fire intervals would provide relatively cool underburns that would discriminate against subalpine fir and enhance whitebark pine. Absence of fire helped promote the mountain pine beetle epidemic of the 1970s, which decimated old-growth PIAL stands in this type in the Elkhorns. Elk and deer actively use these communities for summer resting cover. Western yarrow invades in disturbed areas on old deer beds. Fleecflower invades where elk trampling disturbs the litter.

Relationship to other studies - Pfister (1977) described a subalpine fir/mountain gooseberry habitat type near the southern boundary of Montana where whitebark pine occurred in half the stands along with white spruce. Steele (1981) described subalpine fir/mountain gooseberry in east-central Idaho where whitebark pine and subalpine fir codominated. Elk sedge and heartleaf arnica were the primary herbaceous species. Steele (1983) split subalpine fir/mountain gooseberry into two phases in eastern Idaho and western Wyoming. This plant community type has not been previously described in northeast Oregon.

Table of Environmental Features
ABLA-PIAL/RIMO2/POPU3 (n = 3)

	MEAN		RANGE	
Elevation (ft)	7,720		7,600-7,940	
Slope (%)	33		20-45	
Aspect (no. of plots)	NW 3	NE 0	SE 0	SW 0
Geology	Quartz diorite, argillite			
Position	Lower 1/3, upper 1/3, ridgetops			
Relief	Convex, complex			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
whitebark pine	PIAL	42	100	35-50
subalpine fir	ABLA	15	33	0-15
Tree Understory				
subalpine fir	ABLA	32	100	10-65
whitebark pine	PIAL	18	67	0-35
Shrubs				
mountain gooseberry	RIMO2	7	100	5-10
Sedges				
Ross' sedge	CARO5	8	67	0-15
elk sedge	CAGE2	10	33	0-10
Forbs				
skunk-leaved polemonium	POPU3	18	100	15-20
Sitka valerian	VASI	6	67	0-10
prickly sandwort	ARAC2	1	67	0-1
fleeceflower	POPH	2	67	0-3
arnica	ARNICA	9	67	0-15

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	1	67	0-3
Rock	6	100	1-15
Gravel	13	67	0-35
Moss	3	67	0-5
Lichen	0	0	0
Litter	83	100	70-90

Subalpine Fir-Whitebark Pine/Grouse Huckleberry/Heartleaf Arnica Plant Association
Abies lasiocarpa-*Pinus albicaulis*/*Vaccinium scoparium*/*Arnica cordifolia* (ABLA-PIAL/VASC/ARCO9)



Goat Mountain, Eagle Cap Wilderness, Wallowa Mountains Plot 6216

Distribution - Wallowa Mountains on the Hurwal Formation (Francis Lake, Lostine Canyon, Goat Mountain); Seven Devils and Elkhorn Mountains.

Environmental features - Found on varied geologic substrates (basalt, metabasalt, argillite, quartz diorite) from 7,300 to 8,200 ft elevation (mean = 7,900 ft). The majority of the plots faced the southwest on moderate to steep slopes (25 to 76%). Positions on the landforms were primarily on convex surfaces at ridgetop or upper third of the slope locations. Sites were rocky (28% cover) and gravelly (10% cover).

Soils - Soils are coarse-grained, droughty, and rather acid like most whitebark pine sites, with a thin volcanic ash layer over weathered bedrock. Profiles consisted of gravelly silt loam or very fine sandy loam (0 to 8 inches thick) over very or extremely gravelly or stony loam or sandy loam. Bedrock was present at 21 to 42 inches depth. (N = 4).

Vegetation composition - Whitebark pine-dominated tree overstory layers with subalpine fir usually present as well. The tree understories were codominated by whitebark pine and subalpine fir. The dominant ground cover was grouse huckleberry with pink mountain heath occurring on colder fringes. Herbaceous vegetation was dominated by heartleaf arnica, skunk-leaved polemonium, Ross' sedge, and elk sedge. Average age for whitebark pine in sampled stands was 162 years (122 to 247 years) and 100 years (71 to 152 years) for subalpine fir.

Successional relationships - Whitebark pine precedes subalpine fir following disturbance (fire, avalanche) by about 50 to 60 years.

Disturbance ecology - Fire had underburned in one of the sites about 80 years ago. Consequently, subalpine fir initiated in the stand 77 years ago. These stands were used by deer. Sitka valerian was uniformly grazed by deer for its succulent forage in the dry months of August and September.

Relationship to other studies - ABLA-PIAL/VASC was classified in western Montana (Pfister 1977). It was found to be extensive east of the Continental Divide. The communities there contained both heartleaf arnica and mountain arnica.

This plant association has not been previously described for northeast Oregon and adjacent Idaho.

Table of Environmental Features
ABLA-PIAL/VASC/ARCO9 (n = 8)

	MEAN	RANGE
Elevation (ft)	7,936	7,330-8,220
Slope (%)	52	25-76
Soil pH		5.5-6.5
Soil available water capacity (inches)		1.5 to 3.5 (very low to low)
Depth to bedrock (inches)	31	21-42
Aspect (no. of plots)	NW 1 NE 1 SE 0 SW 4	
Geology	Basalt, metabasalt, argillite, quartz diorite	
Position	Ridgetop, upper 1/3, slope	
Relief	Convex, flat	

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
whitebark pine	PIAL	28	100	20-50
subalpine fir	ABLA	9	100	0-10
Tree Understory				
whitebark pine	PIAL	9	88	3-16
subalpine fir	ABLA	21	100	10-35
Shrubs				
grouse huckleberry	VASC	38	100	20-80
pink mountain heath	PHEM	1	63	0-1
Sedges				
Ross' sedge	CARO5	2	88	0-5
elk sedge	CAGE2	1	50	1-3
Forbs				
heartleaf arnica	ARCO9	6	100	5-10
skunk-leaved polemonium	POPU3	2	50	0-10
Sitka valerian	VASI	1	50	0-1
subalpine daisy	ERPE3	2	38	0-10

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	1	75	0-5
Rock	20	100	5-45
Gravel	7	88	0-30
Moss	8	100	1-25
Lichen	1	25	0-1
Litter	49	100	25-70

Subalpine Fir-Whitebark Pine/Grouse Huckleberry/Ross' Sedge Plant Association

Abies lasiocarpa-*Pinus albicaulis*/*Vaccinium scoparium*/*Carex rossii* (ABLA-PIAL/VASC/CAR05)



Near Mirror Lake, Eagle Cap Wilderness, Wallowa Mountains Plot 6016

Distribution - Wallowa and Seven Devils Mountains.

Environmental features - This type was found on the granodiorites of the Wallowa Batholith and greenstones of the metamorphosed Seven Devils volcanics. Plots ranged from 7,900 to 8,500 ft (mean = 8,300 ft) on moderate to steep slopes with southwesterly aspects. The type was found on convex, concave, and undulating topography at ridgetop, midslope, and lower slope positions.

Soils - The two soil profiles studied were coarse grained, droughty, and rather acidic, formed in residuum over bedrock. Profiles consisted of very to extremely cobbly or stony silt loam or sandy loam. Solid bedrock was present at 18 inches in one profile and granodiorite weathered to extremely stony sand was at a depth of 6 inches in the second profile. Soil pH values ranged from 4.5 to 6.2 in the one profile sampled for pH, and available water capacity was low in both profiles (1.5 to 2 inches). (N = 2).

Vegetation composition - Whitebark pine dominated tree overstory layers with subalpine fir usually absent. However, in the tree understory subalpine fir was codominant with whitebark pine. Grouse huckleberry flourished in the openings and beneath tree canopy gaps. Grasslike

plants occurring were Ross' sedge and smooth and slender woodrushes. Idaho fescue and bluegrasses (Cusick's and Wheeler's) often were associated. Prominent forbs were skunk-leaved polemonium (beneath the tree canopies) and alpine aster.

Successional relationships - Subalpine fir follows the early seral establishment and dominance by whitebark pine. The pines afford protection from winds and ice storms as well as shading from intense solar radiation. In severe ridgetop and upper slope locations when wind shear is severe, Krummholtz stands occur with bannered whitebark pine providing the protection to stunted subalpine fir on the leeward side.

Disturbance ecology - These communities are stable from avalanche and fire. Only one plot was from a site where fire had caused stand replacement resulting in an even-aged whitebark stand of 165-year-old trees. Most communities pertaining to this type are fire independent. Deer use is high. Gopher activity may be high as well. Tailcup lupine and thick-leaved groundsel often dominate an area where gophers have churned the soil.

Relationship to other studies - Subalpine fir-whitebark pine/grouse huckleberry was classified in western Montana (Pfister et al. 1977). Elk sedge and arnica were the principal herbaceous components.

This plant association has not been previously described for northeast Oregon and adjacent Idaho.

**Table of Environmental Features
ABLA-PIAL/RIMO2/POPU3 (n = 5)**

	MEAN		RANGE	
Elevation (ft)	8,282		7,900-8,460	
Slope (%)	37		15-70	
Aspect (no. of plots)	NW 0	NE 1	SE 0	SW 4
Geology	Granite			
Position	Ridgetops, mid to lower slopes			
Relief	Convex, concave, undulating			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
whitebark pine	PIAL	27	100	0-35
subalpine fir	ABLA	15	20	0-15
Tree Understory				
whitebark pine	PIAL	10	100	1-40
subalpine fir	ABLA	17	100	4-45
Shrubs				
grouse huckleberry	VASC	11	100	1-20
Grasses				
Idaho fescue	FEID	1	60	0-1
bluegrasses	POA	1	60	0-1
Sedges				
Ross' sedge	CARO5	2	100	1-5
woodrushes	LUZULA	3	40	0-5
Forbs				
skunk-leaved polemonium	POPU3	13	40	1-25
alpine aster	ASAL2	2	40	0-3
tailcup lupine	LUCA	25	20	0-25
thick-leaved groundsel	SECR	15	20	0-15

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	1	20	0-1
Rock	33	100	15-55
Gravel	2	20	0-10
Moss	1	20	0-3
Lichen	0	0	0
Litter	35	100	10-70

Subalpine Fir-Whitebark Pine/Grouse Huckleberry/Prickly Sandwort Plant Community Type
Abies lasiocarpa-*Pinus albicaulis*/*Vaccinium scoparium*/
Arenaria aculeata
 (ABLA-PIAL/VASC/ARAC2)



Indian Spring Butte, Strawberry Mountains Plot 8890

Distribution - Strawberry and Elkhorn Mountains.

Environmental features - Sites occurred at moderate subalpine elevations (7,600 to 8,700 ft) on gentle to steep easterly and southerly slopes. This type occurs on rocky (35% avg.), gravelly, convex sites at ridgetop or upper slope locations. It was found on Strawberry volcanics (basalt) and granodiorites in the Elkhorns.

Soils - The two soil profiles studied were coarse grained and droughty, formed in residuum over bedrock. Profiles consisted of extremely stony silt loam or sandy loam. Bedrock was present at 43 and 45 inches in the two profiles, with pH values of 6.3 to 6.6 and very low to available water capacity (1.5 to 2 inches). (N = 2).

Vegetation composition - Old-growth whitebark pine dominated the tree overstory (average age = 321 years). Subalpine fir codominated the tree overstory. The orientation of these sites to northerly and easterly directions permits grouse huckleberry to establish and dominate the ground cover. On southerly and westerly aspects ABLA-PIAL/JUPA and ABLA-PIAL/ ARAC2 communities occupy the harsher microenvironment in the absence of grouse huckleberry. Prickly sandwort indicates the droughty nature of these sites, which are weak with herbaceous vegetation. Only Ross' sedge and rushes (Drummond's and slender) were consistently found. Mosses were absent-too dry and too cold on these gravelly, harsh sites.

Successional relationships - Subalpine fir must seek protection from winds, ice storms, and solar radiation beneath the protective crowns of whitebark pine veterans. The whitebark pines establish first after disturbance, and then subalpine fir follows after the pioneer trees afford protection. Lodgepole pine also can provide early successional protection for the subalpine fir seedlings.

Disturbance ecology - The sites are relatively stable. The convex, upper slope and ridgetop settings are less prone to avalanche. Fire frequency is low, and fire severity is low owing to the lack of flashy fuels and rocky, gravelly nature of the sites. Ungulate use is light.

Relationship to other studies - ABLA-PIAL/VASC was classified in western Montana (Pfister 1977). However, prickly sandwort was not a component of those communities.

This plant community type has not been previously described for the mountains of northeast Oregon and adjacent Idaho.

Table of Environmental Features
ABLA-PIAL/VASC/ARAC2 (n = 3)

	MEAN		RANGE	
Elevation (ft)	8,237		7,600-8,650	
Slope (%)	27		10-50	
Stand age (years)	321		221-421	
Aspect (no. of plots)	NW 0	NE 1	SE 2	SW 0
Geology	Basalts, granitics			
Position	Ridgetop, upper 1/3 slope			
Relief	Convex			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
whitebark pine	PIAL	22	100	18-25
Tree Understory				
whitebark pine	PIAL	13	100	1-25
subalpine fir	ABLA	15	100	10-20
Shrubs				
grouse huckleberry	VASC	26	100	18-30
Grasses				
western needlegrass	STOC	5	33	0-5
Grasslikes				
rushes	JUNCUS	6	67	0-11
Ross' sedge	CARO5	1	67	0-1
Forbs				
prickly sandwort	ARAC2	7	100	5-10

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	3	67	0-5
Rock	35	100	30-40
Gravel	4	67	0-5
Moss	0	0	0
Lichen	0	0	0
Litter	37	67	0-60

Subalpine Fir-Whitebark Pine/Grouse Huckleberry-Pink Mountain Heath Plant Community Type
Abies lasiocarpa-*Pinus albicaulis*/*Vaccinium scoparium*-*Phyllodoce empetriformis* (ABLA-PIAL/VASC-PHEM)



Near Moccasin Lake, Eagle Cap Wilderness, Wallowa Mountains Plot 6017

Distribution - Wallowa and Seven Devils Mountains.

Environmental features - Sites were found on granitics in the Wallowa and andesitic rock in the Seven Devils Mountains. Elevation ranged from 7,750 to 8,150 ft (mean = 7,987 ft). These communities occurred on gentle to moderate slopes (mean = 16%); northerly and southerly aspects on ridgetops, upper slopes, and flat benches. Relief was convex to undulating.

Vegetation composition - Whitebark pine dominated the tree overstory layers with subalpine fir either absent or subordinate. In the tree understory, subalpine fir dominated with whitebark pine subordinate. Grouse huckleberry was the dominant ground cover with pink mountain heath associated in cold air pockets and drainages. Ross' sedge, Parry's and Smooth rushes, woolly pussytoes, penstemon, and Cusick's speedwell were the most common herbaceous plants.

Successional relationships - Whitebark pine pioneers after disturbance by fire. In the absence of fire, subalpine fir is capable of succeeding under the protective, insulating cover of the pine. Grouse huckleberry is most dominant on exposed, convex surfaces, whereas pink mountain heath defines the cold air entrapment areas on the flat or concave surfaces. Smooth rush can form dense mats in this type.

Disturbance ecology - Ungulate trampling can induce smooth rush to spread on deeper soil sites. On thinner soils in this type, Parry's rush can increase from surface disturbance. Where animals congregate and trample the soil, increases were noted by penstemon, lupine, or skunk-leaved polemonium.

Relationship to other studies - In the Okanogan Mountains, Williams and Lillybridge (1983) described the similar ABLA/PHEM. Accompanying subalpine fir as a major climax tree species was whitebark pine and Engelmann spruce. Spruce were not a component of ABLA-PIAL/PHEM in northeast Oregon and adjacent Idaho.

This plant community type has not been previously described for northeast Oregon and adjacent Idaho.

Table of Environmental Features
ABLA-PIAL/VASC-PHEM (n = 3)

	MEAN		RANGE	
Elevation (ft)	7,987		7,750-8,150	
Slope (%)	16		10-25	
Aspect (no. of plots)	NW 0	NE 1	SE 0	SW 2
Geology	Granitic, andesitic			
Position	Ridgetop, upper 1/3, flats			
Relief	Convex, undulating			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
whitebark pine	PIAL	40	100	25-55
subalpine fir	ABLA	5	33	0-5
Tree Understory				
whitebark pine	PIAL	2	100	1-5
subalpine fir	ABLA	28	100	15-40
Shrubs				
grouse huckleberry	VASC	17	100	10-20
pink mountain heath	PHEM	7	100	5-10
Grasslikes				
Ross' sedge	CARO5	2	100	1-3
Parry's rush	JUPA	10	67	0-10
Smooth woodrush	LUHI4	60	33	0-60
Forbs				
heartleaf arnica	ARCO9	15	33	0-15
skunk-leaved polemonium	POPU3	15	33	0-15
penstemon	PENST	1	67	0-1
tailcup lupine	LUCA	5	33	0-5
woolly pussytoes	ANLA3	3	67	0-5
Cusick's speedwell	VECU	1	67	0-1

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	4	67	0-10
Rock	47	100	30-60
Gravel	1	33	0-1
Moss	7	100	1-10
Lichen	0	0	0
Litter	18	100	10-30

Subalpine Fir-Whitebark Pine/Green Fescue Plant Association

Abies lasiocarpa-*Pinus albicaulis*/*Festuca viridula*
(ABLA-PIAL/FEVI)



Near China Cap, Eagle Cap Wilderness, Wallowa Mountains Plot 6242

Distribution - Wallowa Mountains.

Environmental features - Found on granitic, basaltic, and metamorphic rocks in the Wallowa Mountains. Plots ranged from 7,800 to 8,600 ft elevation. All sites were on southwest exposures at upper slope positions on convex surfaces. Slopes were moderate to steep (47% avg.).

Soils - The sole soil profile studied was medium grained and deep, formed in loess over colluvium; this soil was deeper and can hold more water than soils of other whitebark pine sites. The profile consisted of cobbly fine sandy loam down to the depth of observation (60 inches). Soil pH values ranged from 6.2 to 6.6, and available water capacity was moderate (7 inches). (N = 1).

Vegetation composition - Whitebark pine dominated tree overstory canopy layers with subalpine fir often absent. In tree understory layers, subalpine fir and whitebark pine were always present with subalpine fir dominating. The dominant herbaceous plant was green fescue. Yarrow and prickly sandwort were always associated. Other plants with high occurrence were Ross' sedge and Wheeler's bluegrass. Due to steep, gravelly slopes, and the harsh southwest exposures, mosses and lichens are unable to establish in this type.

Successional relationships - Whitebark pine pioneers prior to the establishment of subalpine fir. One plot characterized this type in a Krummholtz structural stand. The whitebark pine dominated in erect 10 to 12 ft tall trees over a prostrate 4 ft tall layer of subalpine fir in the Krummholz stand.

Disturbance ecology - Fire has historically underburned with moderate to low frequency. Elk and deer use these communities for grazing of the fescue and for thermal cover. Deer use was noticeably high as bedding habitat. Plants invading and increasing from ungulate disturbance are linanthastrum, silky lupine, and skunkleaved polemonium.

Relationship to other studies - ABLA-PIAL/FEVI has not been classified previously. However, a PIAL/FEVI plant association was described on the Wenatchee and Okanogan National Forests (east slopes of the Cascade Range in Washington) by Lillybridge (1995). It is found as tree islands (community fragments) in a shrubland dominated by mountain big sagebrush.

Table of Environmental Features
ABLA-PIAL/FEVI (n = 7)

	MEAN		RANGE	
Elevation (ft)	8,210		7,760-8,700	
Slope (%)	53		35-65	
Stand age (years)			294 (1 tree)	
Aspect (no. of plots)	NW 0	NE 0	SE 0	SW 7
Geology	Granitic, basalt, metamorphic rock			
Position	Upper 1/3 slopes			
Relief	Convex			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
whitebark pine	PIAL	36	100	16-60
subalpine fir	ABLA	1	29	0-5
Tree Understory				
whitebark pine	PIAL	7	100	1-20
subalpine fir	ABLA	29	100	15-45
Shrubs				
grouse huckleberry	VASC	2	29	0-10
Grasses				
green fescue	FEVI	10	100	5-20
Wheeler's bluegrass	PONEW	2	57	0-3
Sedges				
Ross' sedge	CARO5	2	71	0-5
elk sedge	CAGE2	3	57	0-10
Forbs				
prickly sandwort	ARAC2	4	100	1-10
common yarrow	ACMIL	1	71	0-3
linanthastrum	LINU4	3	43	0-10
arnicas	ARNICA	2	57	0-3
skunk-leaved polemonium	POPU3	1	43	0-5

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	6	100	1-25
Rock	14	86	0-35
Gravel	11	71	0-30
Moss	1	29	0-3
Lichen	0	0	0
Litter	56	100	5-95

Subalpine Fir-Whitebark Pine/Elk Sedge Plant Association
Abies lasiocarpa*-*Pinus albicaulis*/*Carex geyeri
(ABLA-PIAL/CAGE2)



Vinegar Hill, Greenhorn Mountains Plot 8817

Distribution - Elkhorn, Strawberry, Greenhorn, and Wallowa Mountains.

Environmental features - This type was found on andesites, serpentines, and quartzite rock. It occurs at low to mid-subalpine elevations (7,700 to 8,100 ft) on gentle to moderate slopes. This type was found on southerly or northerly aspects at ridgetop or upper slope positions and on convex topographic settings.

Soils - The sole soil profile studied was coarse grained but fairly deep, formed in residuum over bedrock. The profile consisted of very gravelly silt loam to a depth of 18 inches, over extremely stony silt loam to a depth of 39 inches, over bedrock. Soil pH values were 6.0 to 6.3, and available water capacity was moderate (6 inches). (N = 1).

Vegetation composition - Whitebark pine dominated the tree overstory canopy layer, and subalpine fir dominated the understory tree canopy layer. With the exception of occasional mountain gooseberry, the associated vegetation is all herbaceous. Elk sedge defines the type with Ross' sedge often present. Forbs that are highly present are Gray's lovage, skunk-leaved polemonium, Sitka valerian, and prickly sandwort. The sites are too harsh for moss and lichen establishment. Whitebark pine trees ranged in age from 145 to 221 years on sampled plots.

Successional relationships - Fire retardation has caused increased subalpine fir stocking to a type that historically has been maintained to whitebark pine dominance and open understories. The 1970s era lodgepole pine bark beetle epidemic spread to whitebark pine and caused high mortality in stands of this type. This is a particularly drought-tolerant subalpine fir-whitebark pine type that is now vulnerable to stand-replacing fire owing to (1) lower vigor from overstocking allowing for greater bark beetle and blister rust mortality, and (2) ladder fuels promoting fire into crowns of veteran whitebark trees by subalpine fir saplings and poles.

Disturbance ecology - These stands are heavily used by elk for thermal cover. Increasing with ungulate trampling by deer and elk are patches of skunk-leaved polemonium and alpine knotweed. Domestic sheep overgrazing permitted western needlegrass to increase and invade in this type.

Relationship to other studies - Pfister (1977) classified subalpine fir/elk sedge habitat type with whitebark pine usually associated. Steele (1981) followed with a similar description in central Idaho. Hall (1973) described subalpine fir-whitebark pine/elk sedge plant community type in the Blue Mountains on granitic and serpentine sites. This plant association follows the treatment by Hall (1973).

Table of Environmental Features
ABLA-PIAL/CAGE2 (n = 5)

	MEAN		RANGE	
Elevation (ft)	7,930		7,700-8,100	
Slope (%)	29		15-35	
Stand age (years)	175		145-221	
Aspect (no. of plots)	NW 1	NE 1	SE 0	SW 2
Geology	Andesite, serpentine, chert, quartzite			
Position	Ridgetop, upper 1/3 slopes			
Relief	Convex			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
whitebark pine	PIAL	35	100	23-65
subalpine fir	ABLA	1	60	0-3
Tree Understory				
whitebark pine	PIAL	6	100	3-15
subalpine fir	ABLA	23	100	5-51
Shrubs				
mountain gooseberry	RIMO2	1	40	0-1
Grasses				
western needlegrass	STOC	1	40	0-5
Sedges				
Ross' sedge	CARO5	2	60	0-5
elk sedge	CAGE2	22	100	3-65
Forbs				
skunk-leaved polemonium	POPU3	5	80	0-25
Sitka valerian	VASI	1	60	0-1
prickly sandwort	ARAC2	2	60	0-5
Gray's lovage	LIGR	1	80	1-5
goosefoot violet	VIPU4	1	40	0-3
thick-leaved groundsel	SECR	1	40	0-1
western hawkweed	HIAL2	1	40	0-3
fleeceflower	POPH	1	40	0-1

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	4	100	1-10
Rock	8	100	5-10
Gravel	5	80	1-15
Moss	0	0	0
Lichen	0	0	0
Litter	72	100	55-90

Subalpine Fir-Whitebark Pine/Parry's Rush - Lemmon's Needlegrass Plant Association
Abies lasiocarpa-*Pinus albicaulis*/*Juncus parryi*-*Stipa lemmonii*
 (ABLA-PIAL/JUPA-STLE2)



Traverse Lake Basin, Eagle Cap Wilderness, Wallowa Mountains Plot 6192

Distribution - Southern Wallowa Mountains.

Environmental features - Found on volcanic sandstones and greenstones of the Clover Creek Formation and on granitic rocks in the high alpine of the southern Wallowa Mountains. Elevations ranged from 8,200-9,200 ft (mean = 8,640 ft). This type was found on ridges and upper slopes on moderate to steep sites. Communities were all on convex to undulating relief with southerly aspects. Sites were rocky (mean = 48%) and gravelly (mean = 26%).

Soils - The two soil profiles studied were coarse grained, fairly shallow, and rather acidic, formed in residuum over bedrock. One of the profiles had an ash-influenced loamy surface layer to 5 inches deep, over cobbly and very cobbly loam or sandy loam, with bedrock at 21 inches deep. The other was extremely bouldery sandy loam with bedrock at 14 inches deep. Soil pH values were 5.5 to 6.5 available water capacity was very low (0.5 inch) and low (4 inches) in the two profiles. (N = 2).

Vegetation composition - A grass, Lemmon's needlegrass, and a rush, Parry's rush, define this type. Whitebark pine dominates tree overstory layers. In tree understories subalpine fir dominates over whitebark pine. Common juniper was often present on these gravelly, rocky sites. Another harsh site plant frequently found was prickly sandwort. Both plants are adapted to the dry, mobile gravels of these sites. Ross' sedge was consistently present.

Successional relationships - Whitebark pine pioneers these rocky, gravelly, south slope and ridge crest communities. The subalpine fir succeeds to co-dominance beneath the protective canopies of whitebark pine old growth.

Disturbance ecology - These communities lack desired forage species for ungulates. Deer use these stands for shelter. Ground squirrels often excavate burrows. Plants which increase with disturbance are penstemons, lupines, and alpine knotweed. These plants are all helpful in stabilizing gravelly slopes from soil movement.

Relationship to other studies - This type has not been described previously.

Table of Environmental Features
ABLA-PIAL/JUPA-STLE2 (n = 5)

	MEAN		RANGE	
Elevation (ft)	8,512		8,190-9,230	
Slope (%)	52		30-70	
Stand age (years)	PIAL	228	170-283	
	ABLA	130	130	
Aspect (no. of plots)	NW 0	NE 0	SE 2	SW 2
Geology	Granite, argillite, greenstone			
Position	Ridgetop, upper 1/3 slope			
Relief	Convex, undulating			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
whitebark pine	PIAL	26	100	18-40
subalpine fir	ABLA	1	20	0-3
Tree Understory				
whitebark pine	PIAL	3	100	1-6
subalpine fir	ABLA	18	100	5-25
Shrubs				
grouse huckleberry	VASC	2	40	0-10
common juniper	JUCO6	1	40	0-1
Grasses				
Lemmon's needlegrass	STLE2	7	100	1-15
Grasslikes				
Ross' sedge	CARO5	3	80	1-10
Parry's rush	JUPA	6	100	1-20
Forbs				
skunk-leaved polemonium	POPU3	1	40	0-1
prickly sandwort	ARAC2	2	80	0-5
penstemon	PENST	1	60	0-1

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	3	100	1-5
Rock	50	100	30-70
Gravel	23	100	10-50
Moss		0	
Lichen		0	
Litter	20	100	5-35

SUBALPINE FIR-WHITEBARK PINE PLANT COMMUNITIES

Subalpine Fir-Whitebark Pine/Mountain Juniper-Pinemat Manzanita

Abies lasiocarpa-Pinus albicaulis/Juniperus communis montana-Arctostaphylos nevadensis

ABLA-PIAL/JUCO6-ARNE (n = 1)

This community was found on gabbro at the summit of Pine Creek Mountain in the Strawberry Mountains. Trees were of low stature (15 to 20 ft tall) and bannered by ice and winds. Subalpine fir was associated with whitebark pine. Whitebark pine clearly dominated the stand. Common juniper, pinemat manzanita, and prickly sandwort were the prominent plants covering the ground beneath and between the trees. Needlegrass, Wheeler's bluegrass, bottlebrush squirreltail, and elk sedge were present in trace amounts. Bedrock, rock, and gravel constituted a coverage of 70%. Tree age was 227 years.

Subalpine Fir-Whitebark Pine/Mountain Juniper

Abies lasiocarpa-Pinus albicaulis/Juniperus communis montana

ABLA-PIAL/JUCO6 (n = 2)

These communities were found on granitic outcrops in the Wallowa Mountains. Whitebark pine dominated over subalpine fir in the overstory. In Krummholz stands it was codominant with subalpine fir. Common juniper is a rocky outcrop species and defines these plant communities with prickly sandwort, skunk-leaved polemonium, and Ross' sedge. Cusick's and slender bluegrasses are often associated. Bedrock, rock, and gravels had high coverage values on these sites (55% and 90%).

Subalpine Fir-Whitebark Pine/Grouse Huckleberry/Green Fescue

Abies lasiocarpa-Pinus albicaulis/Vaccinium scoparium/Festuca viridula

ABLA-PIAL/VASC/FEVI (n = 1)

This community was found in the Wallowa Mountains on granitic outcrops along ridgetops. The sole soil studied formed in granodiorite grus and was rather acidic (pH 4.8 to 6.6) and droughty (available water capacity about 2 inches). The profile consisted of coarse sandy loam to 5 inches deep, over very gravelly coarse sand and loamy sand to bedrock at 40 inches deep. Whitebark pine and Engelmann spruce were pioneers following disturbance. The tree understory was dominated by subalpine fir now succeeding in the absence of fire. The understory vegetation was dominated by grouse huckleberry with green fescue, Wheeler's bluegrass, Ross' sedge, and prickly sandwort.

Subalpine Fir-Whitebark Pine/Grouse Huckleberry/Little Ricegrass

Abies lasiocarpa-Pinus albicaulis/Vaccinium scoparium/Oryzopsis exigua

ABLA-PIAL/VASC/OREX (n = 1)

This site was found in the Wallowa Mountains on granitic outcrops. Old whitebark pines (220 years) occupied the tree overstory layer, and subalpine fir dominated the tree understory layer. This reflects the exclusion of cool underburns in the ecosystem permitting fir to succeed. Grouse huckleberry was prominent beneath the tree canopies with little ricegrass. In the openings away from shading and tree protection, prickly sandwort, Cusick's speedwell, woolly pussytoes, and Parry's rush occupied the gravelly, warm, dry sites.

Subalpine Fir-Whitebark Pine/Grouse Huckleberry/Wallowa Lewisia

Abies lasiocarpa-Pinus albicaulis/Vaccinium scoparium/Lewisia columbiana wallowensis

ABLA-PIAL/VASC/LECOW2 (n = 1)

These communities are found in the Seven Devils on metabasaltic outcrops along ridgetops and on glacially scoured outcrops in cirque basins. The sole soil studied was quite acidic (pH 4.0 to 4.7) and droughty (available water capacity about 1.5 inches). The profile consisted of very gravelly sandy loam and silt loam over bedrock at 14 inches deep. These outcrop communities are dominated by old whitebark pines, which are infrequently visited by fire. Subalpine fir codominates the tree understory as a "skirting" beneath the protecting branches of the hardy whitebark pines. Grouse huckleberry dominated the troughs between outcrops, and Wallowa lewisia occupied the fissures in the rocky outcroppings. Sickletop lousewort was prominent. Chionophila occupied snowbank-recession depressions.

Subalpine Fir-Whitebark Pine/Prickly Sandwort

Abies lasiocarpa-Pinus albicaulis/Arenaria aculeata

ABLA-PIAL/ARAC2 (n = 3)

These plant communities are found in the Strawberry Mountains on andesites and in the Elkhorn Mountains on diorite and argillite. Sites ranged from 7,600 to 8,100 ft on moderate to steep southerly slopes near ridgetops where past sheep overgrazing has been severe. Whitebark pine and subalpine fir are subdominant with subalpine fir prominent in tree understory layers as a result of fire retardations. Prickly sandwort defines the type. Prominent herbaceous plants, as a result of aggressive colonizations following heavy occurrence by livestock, were western needlegrass, fleecflower, penstemon, lupine, phlox, showy aster, and golden buckwheat.

Subalpine Fir-Whitebark Pine/Skunk-leaved Polemonium
Abies lasiocarpa-Pinus albicaulis/polemonium pulcherrimum
(ABLA-PIAL/POPU3) (n = 2)

This plant community type occurs on quartz-diorite derived soils in the Seven Devils Mountains. Elevations ranged from 7,770-7,830 ft. Plots were located on steep, westerly, upper slopes of varied relief. Whitebark pine old growth dominated the tree overstory, and subalpine fir dominated tree understory layers. Herbaceous vegetation consistently present were skunk-leaved polemonium, Ross' sedge, Wheeler's bluegrass, heartleaf and hairy arnica, and leafy aster. Mosses and lichens were absent from these harsh, southwesterly, steep slope sites. Subalpine fir will codominate with whitebark pine as these mid-seral stands develop in the absence of modifying disturbances. Whitebark pine established first after fire or avalanche replaced the previous forest. Fire frequency is low. Ungulate use promotes globe penstemon, leafy aster, subalpine daisy, and tailcup lupine. Heavy ground squirrel activity promotes bigleaf sandwort, meadowrue, and yarrow.

SUBALPINE FIR-ENGELMANN SPRUCE VEGETATION

Subalpine Fir-Engelmann Spruce/Labrador Tea Plant Association
Abies lasiocarpa-Picea engelmannii/Ledum glandulosum
(ABLA-PIEN/LEGL)



Near Lee Lake, Eagle Cap Wilderness, Wallowa Mountains Plot 6007

Distribution - Wallowa Mountains.

Environmental features - This plant association was found only on granodiorites in the Wallowa Mountains. Elevational range was 6,000 to 7,500 ft (mean = 7,200 ft). Slopes were gentle to moderate (mean = 20%). Westerly aspects dominated. Sites were found on convex, concave, and undulating surfaces on the edges of wetlands, at toe slope, and mid-slope locations. This type requires cool-cold air ponding and high soil moistures to persist. It is found in the cirque lake basins where perched benches resulted from glacial sculpting of basin walls.

Soils - Soils formed in volcanic ash over weathered bedrock or compact glacial till; they have moderate to high water-holding capacity. Profiles consist of silt loam to a depth of 15 to 24 inches, over gravelly to extremely gravelly sand (weathered granodiorite) or very cobbly or bouldery sandy loam with dense till at 34 to 48 inches. An organic surface horizon up to 2 inches thick is present in some profiles. (N = 5)

Vegetation composition - Spruce and subalpine fir were codominant in tree overstory layers. In tree understory layers, subalpine fir clearly dominated over spruce. Lodgepole pine was a minor component. Shrubs dominating were Labrador tea and grouse huckleberry. Often present on these cold sites was pink mountain heath. Woodrushes (*Luzula parviflora* and *L. glabrata*) were often present and abundant. Forbs generally associated were round-leaved violets, subalpine daisy, green false hellebore, and fringeleaf cinquefoil. Mosses were prominent (mean = 14%). Subalpine fir trees ranged in age from 100 to 280 years (mean = 182 years); Engelmann spruce trees ranged in age from 132 to 268 years (mean = 225 years). One lodgepole pine was 248 years old! These are sites where lack of mortality from fire and ideal growing conditions enable lodgepole pine to achieve maximum longevity and large girth (15 inches diameter breast height).

Successional relationships - Engelmann spruce achieves dominance after a disturbance event brings in lodgepole pine. The subalpine fir component initiates in the latter part of the early seral stage and achieves dominance in late seral stage. Labrador tea prefers deep, rock-free ash soils and shade. Grouse huckleberry thrives on rocky, convex microsites where direct sunlight is afforded. Labrador tea defines see pages, rivulets, and wet depressions. Woodrushes tend to occupy open areas between Labrador tea shrubs on the deeper soil sites.

Disturbance ecology - Fire is infrequent, but when ignited, stands are replaced. Lodgepole pine and spruce quickly cover burned areas with grouse huckleberry. Elk make high use of these stands as they are often near meadows where forage is available. These sites provide excellent thermal cover.

Relationship to other studies - Steele (1981) described a subalpine fir/bluejoint reedgrass habitat type with a Labrador tea phase in central Idaho that is similar (except for the absence of the reedgrass in the Wallowa Mountain plots). This is the first description of the ABLA-PIEN/LEGL plant association.

**Table of Environmental Features
ABLA-PIEN/LEGL (n = 13)**

	MEAN		RANGE	
Elevation (ft)	7,178		6,040-7,520	
Slope (%)	20		2-40	
Soil pH			6.0-6.5	
Soil available water capacity (inches)			6-10 inches (moderate to high)	
Thickness of volcanic ash mantle	18 inches		15-24 inches	
Stand age (years)	ABLA PIEN	182 225	100-280 132-268	
Aspect (no. of plots)	NW 4	NE 5	SE 1	SW 3
Geology	Granitic			
Position	Slopes mid 1/3, lower 1/3; edge of wetlands			
Relief	Convex, concave, undulating			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
subalpine fir	ABLA	24	85	85
Engelmann spruce	PIEN	14	85	85
lodgepole pine	PICO	3	31	31
Tree Understory				
subalpine fir	ABLA	12	100	100
Engelmann spruce	PIEN	2	54	54
lodgepole pine	PICO	2	15	15
Shrubs				
grouse huckleberry	VASC	47	100	100
pink mountain heath	PHEM	5	54	54
Labrador tea	LEGL	42	100	100
dwarf huckleberry	VACA13	2	23	23
Grasslikes				
Ross' sedge	CARO5	2	38	38
Parry's rush	JUPA	1	38	38
woodrush	LUZULA	11	77	77
Forbs				
heartleaf arnica	ARCO9	4	46	46
skunk-leaved polemonium	POPU3	1	38	38
Sitka valerian	VASI	2	31	31
round-leaved violet	VIOR	4	54	54
sickletop lousewort	PERA	2	46	46
subalpine daisy	ERPE3	5	62	62
Gray's licoriceroot	LIGR	1	46	46
green false hellebore	VEVI	2	62	62
woolly pussytoes	ANLA3	4	46	46
fernleaf licoriceroot	LIFIT	1	38	38
fringe-leaf cinquefoil	POFL	1	54	54

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	1	38	0-3
Rock	7	85	0-45
Gravel	1	31	0-1
Moss	14	92	0-70
Lichen	1	23	0-1
Litter	72	100	20-95

Subalpine Fir-Engelmann Spruce/Fool's Huckleberry Plant Association

Abies lasiocarpa-Picea engelmannii/Menziesia ferruginea
(ABLA-PIEN/MEFE)



Bridge Creek, Seven Devils Mountains Plot 7001

Distribution - Seven Devils Mountains.

Environmental features - This type is restricted to cold, moist, lower subalpine elevations (6,200 to 7,600 ft) in the Seven Devils Mountains. It is usually on northerly aspects, steep slopes (mean = 37%) at upper to lower slope positions. It favors drainage headlands and cornice locations on concave to undulating surfaces. In the Devils, it was most commonly found on metavolcanics and andesites but also occurred on quartz diorite substrates.

Soils - Soils formed in volcanic ash over colluvium and have low to moderate available water capacity. Profiles consist of an organic surface layer 2 to 3 inches thick, over gravelly or stony silt loam to a depth of 10 to 26 inches, over extremely gravelly sandy loam or loam. (N = 7).

Vegetation composition - Engelmann spruce dominated the tree overstory layers with subalpine fir and decadent lodgepole pine usually associated. The tree understory is dominated by subalpine fir. Fool's huckleberry forms dense undergrowth (mean = 54%) with high coverages by both grouse huckleberry (mean = 14%) and big huckleberry (15%). The shrub cover is very dense resulting in low coverages by associated

forbs. The most common forbs are pyrolas (sidebells and pink), sickletop lousewort, rattlesnake plantain, and arnica (heartleaf and mountain). Beargrass occurred with high coverage in some fool's huckleberry communities in Idaho. Stand ages for mid to late seral stands averaged under 200 years. Engelmann spruce (mean = 180 years) and lodgepole pine (mean = 167 years) initiated prior to subalpine fir (mean = 155 years). Moss cover averaged 40%.

Successional relationships - Lodgepole pine enters these stands following infrequent stand-replacement burns. Historically, fires underburned owing to higher diurnal humidities. Fire readily kills subalpine fir and Engelmann spruce in moderate or severe burns. Fool's huckleberry endures the burn with vigorous resprouting on steep slope sites. Fireweeds and arnicas are quick to cover severely burned sites the first year after the burn.

Disturbance ecology - Elk and deer use these sites for thermal cover. Beargrass was notably grazed severely by wild ungulates. When downed logs protected beargrass plants, the hedging was reduced in severity.

Relationship to other studies - Daubenmire and Daubenmire (1968) described ABLA/MEFE with beargrass as a frequent associate throughout central Idaho. Pfister et al. (1977), Steele, et al. (1981), and Cooper et al. (1991) described subalpine fir/fool's huckleberry with phases. This plant association was previously described in the Seven Devils Mountains by Johnson and Simon (1987).

Table of Environmental Features

ABLA-PIEN/MEFE (n = 8)

	MEAN	RANGE
Elevation (ft)	7,043	6,230-7,620
Slope (%)	37	5-65
Soil pH		5.5-6.5
Soil available water capacity (inches)		3.5 to 5.5 inches (low to moderate)
Thickness of volcanic ash mantle	20 inches	10-26 inches
Stand age (years)		
	ABLA 155	119-182
	PIEN 180	140-260
	PICO 166	110-205
Aspect (no. of plots)	NW 3 NE 4 SE 1 SW 0	
Geology	Andesite, quartz diorite, meta volcanics	
Position	Upper, mid, lower, and toe slopes	
Relief	All	

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
subalpine fir	ABLA	18	88	0-50
Engelmann spruce	PIEN	23	75	0-45
lodgepole pine	PICO	12	63	0-23
Tree Understory				
subalpine fir	ABLA	17	100	10-25
Engelmann spruce	PIEN	4	50	0-11
Shrubs				
grouse huckleberry	VASC	14	88	0-40
big huckleberry	VAME	15	63	0-60
Utah honeysuckle	LOUT2	2	38	0-3
fool's huckleberry	MEFE	54	100	20-85
prince's pine	CHUM	2	50	0-5
Forbs				
arnicas	ARNIC	3	63	0-15
pyrolas	PYROL	5	88	0-20
sickletop lousewort	PERA	6	38	0-15
rattlesnake plantain	GOOB2	3	75	0-10
beargrass	XETE	23	25	0-30

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	1	63	0-3
Rock	10	75	0-35
Gravel	1	63	0-5
Moss	40	88	0-70
Lichen	3	63	0-15
Litter	43	100	20-60

Subalpine Fir-Engelmann Spruce/Queen's Cup Beadlilly Plant Association

Abies lasiocarpa-*Picea engelmannii*/*Clintonia uniflora*
(ABLA-PIEN/CLUN2)



Moss Springs, Eagle Cap Wilderness, Wallowa Mountains Plot 1334

Distribution - Wallowa Mountains. Note: This plant association occurs frequently in the northern Blue Mountains and along major canyon bottoms in the Wallowa Mountains. This description is for the subalpine of the Wallowas only to portray the type at its highest elevations.

Environmental features - The highest elevation plots pertaining to ABLA/CLUN2 ranged from 5,600 to 5,800 ft on flat or convex surfaces. Slopes were gentle (mean = 10%) on canyon bottoms or toe slope locations. Aspects were northerly or southerly. The type occurs on basaltic and granitic substrates.

Soils - The two soils studied consisted of thick volcanic ash with high available water capacity (10 to 12 inches) and dark coloration owing to high organic matter content. Profiles consisted of silt loam or silty clay loam to a depth of at least 2 ft. (N = 2).

Vegetation composition - Tree overstories were consistently dominated by Engelmann spruce. Subalpine fir was associated in tree overstories in stands older than 100 years. Western larch was present as a pioneer after stand-replacement fire in stands less than 100 years of age. Tree understories were dominated by subalpine fir. Big huckleberry was always present. Herbaceous vegetation was dominated by queen's cup

beadlilly in a rich assemblage of undergrowth. Species consistently present were Columbia brome, heartleaf arnica, sidebells pyrola, meadowrue, sweet cicely, round-leaved violet, rattlesnake plantain, coolwort foamflower (tiarella), sweetscented bedstraw, green false hellebore and Columbia monkshood. These herbaceous plants all thrive in cool, moist environments found where cold air drains and ponds.

Successional relationships - Heartleaf arnica tends to increase with surface disturbances. Earlier seral stands have high solar radiation permitting greater dominance by sun-loving members of this type (e.g., big huckleberry, Columbia brome, and heartleaf arnica). In late seral stands, queen's cup beadlilly, fairybells, and foamflower all tolerate shady, cool conditions provided by greater tree canopy closure. Mosses averaged 28% for all plots sampled (but 35% cover in mid-late seral plots).

Disturbance ecology - Primary disturbances come from windthrow, fire, and elk. Fires are infrequent, and stand-replacing fires are uncommon. Elk use is high in these communities - thermal cover.

Relationship to other studies - This type is similar to Daubenmire's grand fir/Oregon boxwood habitat type (Daubenmire and Daubenmire 1968). Pfister et al. (1977) first described subalpine fir/queen's cup beadlilly (ABLA/CLUN2) in western Montana. Steele et al. (1981) identified ABLA/CLUN2 in west, central Idaho. Cooper et al. (1991) replaced ABLA/PAMY with ABLA/CLUN2 in reclassifying Daubenmire's plots in northern Idaho. Williams et al. (1990) classified vegetation on the Colville of northeast Washington to ABLA/CLUN2. The ABLA/CLUN2 plant association was previously described for northeast Oregon (Johnson and Simon 1987).

**Table of Environmental Features
ABLA-PIEN/CLUN2 (n = 4)**

	MEAN		RANGE	
Elevation (ft)	5,708		5,580-5,800	
Slope (%)	10		5-20	
Stand age (years)	ABLA	110	100-120	
	PIEN	86	82-90	
Aspect (no. of plots)	NW 0	NE 3	SE 0	SW 1
Geology	Basalt, granite			
Position	Slopes, lower 1/3, canyon bottoms			
Relief	Convex, flat			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
Engelmann spruce	PIEN	35	100	10-75
subalpine fir	ABLA	13	50	0-15
western larch	LAOC	30	25	0-30
Tree Understory				
subalpine fir	ABLA	8	100	2-15
Engelmann spruce	PIEN	3	100	1-6
Shrubs				
big huckleberry	VAME	6	100	1-20
Grasses				
Columbia brome	BRVU	1	100	1-1
Forbs				
queen's cup beadlilly	CLUN2	23	100	10-55
heartleaf arnica	ARCO9	8	100	1-30
Sitka valerian	VASI	2	50	0-3
sidebells pyrola	PYSE	4	100	1-10
wood nymph	PYUN	1	50	0-1
western meadowrue	THOC	5	100	1-15
sweet cicely	OSCH	2	100	1-3
round-leaved violet	VIOR	6	100	1-15
rattlesnake plantain	GOOB2	2	75	0-3
green false hellebore	VEVI	1	75	0-1
sweet scented bedstraw	GATR2	1	75	0-1
Columbia monkshood	ACCO4	1	75	0-1
coolwort foamflower	TITRU2	25	75	0-40
wartberry fairybells	DITR	1	50	0-1
white-flowered hawkweed	HIAL	3	50	0-5

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	1	25	0-1
Rock	1	25	0-1
Gravel	1	25	0-1
Moss	28	75	0-40
Lichen	1	75	0-1
Litter	68	100	55-95

Subalpine Fir-Engelmann Spruce/Heartleaf Arnica Plant Association

Abies lasiocarpa-*Picea engelmannii*/*Arnica cordifolia*
(ABLA-PIEN/ARCO9)



Near Horse Heaven Lake, Seven Devils Mountains Plot 7040

Distribution - Wallowa, Seven Devils, and Strawberry Mountains.

Environmental features - A wide ranging plant association at lower subalpine elevations ranging from 6,000 to 7,200 ft on basalt, peridotite, and quartz diorite. Sampled sites were on all landscape positions, on flat to steep slopes (mean = 21%), and on most aspects. Surfaces were mostly concave to undulating.

Vegetation composition - Engelmann spruce dominated these cold air pocket sites. Subalpine fir was present in the overstory layers but dominated tree understories in these mid to late seral stands. Shrubs were in low coverage owing to the dense tree canopy cover. The most abundant plant in the herbaceous vegetation of this type was heartleaf arnica. Other cold environmental forbs usually present are skunk-leaved polemonium, Sitka valerian, meadowrue, and sidebells pyrola. Spruce sampled from tree overstories averaged 266 years in age.

Successional relationships - Lodgepole pine, white pine, and Douglas-fir often precede spruce and subalpine fir following stand-replacement fires. After fires, the huckleberries, lupines, and arnicas dominate. With later seral stages and canopy closure, tolerant species are dominant (e.g., sidebells pyrola, round-leaved violet, Sitka valerian, bigleaf sandwort).

Disturbance ecology - Fires are infrequent in this plant association. These communities develop from stand replacement burns or within a fire mosaic.

Relationship to other studies - The subalpine fir/heartleaf arnica habitat type in Idaho (Steele 1981), Montana (Pfister et al 1977), and western Wyoming (Steele 1983) is apparently unique to the northern Rocky Mountains where soils form principally from quartzites. This spruce-dominated subalpine fir plant association has not been previously described in the Blue, Wallowa, or Seven Devils Mountains.

Table of Environmental Features
ABLA-PIEN/ARCO9 (n = 8)

	MEAN		RANGE	
Elevation (ft)	6,596		6,010-7,180	
Slope (%)	21		5-47	
Aspect (no. of plots)	NW 3	NE 2	SE 3	SW 0
Geology	Basalt, peridotite, quartz diorite			
Position	Slopes - upper, mid, lower; bottom			
Relief	Concave, undulating			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
subalpine fir	ABLA	2	57	0-5
Engelmann spruce	PIEN	48	100	40-55
Tree Understory				
subalpine fir	ABLA	16	100	3-40
Engelmann spruce	PIEN	2	57	0-10
Shrubs				
grouse huckleberry	VASC	1	50	0-1
big huckleberry	VAME	1	38	0-5
prince's pine	CHUM	1	38	0-5
currents/gooseberries	RIBES	1	50	0-5
Forbs				
heartleaf arnica	ARCO9	20	100	10-40
skunk-leaved polemonium	POPU3	4	75	0-10
Sitka valerian	VASI	1	63	0-1
sidebells pyrola	PYSE	5	75	0-15
meadowrue	THOC	5	88	0-15
sweet cicely	OSCH	1	63	0-1
sickletop lousewort	PERA	1	50	0-1
round-leaved violet	VIOR	1	38	0-3
bigleaf sandwort	ARMA18	1	63	0-5

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	0	0	0
Rock	8	50	0
Gravel	1	13	0-30
Moss	6	100	0-5
Lichen	1	13	1-15
Litter	70	100	0-1
			60-95

SUBALPINE FIR-ENGELMANN SPRUCE PLANT COMMUNITIES

Subalpine Fir-Engelmann Spruce/False Bugbane *Abies lasiocarpa-Picea engelmannii/Trautvetteria caroliniensis*

ABLA-PIEN/TRCA (n = 1)

Engelmann spruce dominated all tree layers on a perched bench where glacial plucking and sculpting left a moist, cool cove for spruce establishment. Subalpine fir seedlings and saplings were present in scattered, low coverages. The ground cover was dominated by forbs. False bugbane, meadowrue, and heartleaf arnica covered 65% of the site. The community had a rich assemblage of plants with a list of 36 shrub, grass, and forb species. Columbia brome occurred with a coverage of 10%. The site was impacted heavily by deer and elk. Past trampling created surface soil disturbance patches now covered by enchanters' nightshade and woods strawberry. The representative plot sampled was at 5,800 ft near Twin Lakes in the Wallowa Mountains.

Subalpine Fir-Engelmann Spruce/Arrowleaf Groundsel *Abies lasiocarpa-Picea engelmannii/Senecio triangularis*

ABLA-PIEN/SETR (n = 2)

This community occupied a cold, moist stream terrace and was dominated by Engelmann spruce in the overstory. Subalpine fir was present in tree overstory and understory layers. It codominates with Engelmann spruce in the late seral stage. Shrubs are occasional. Forbs provide virtually all the herbaceous ground cover. Arrowleaf groundsel, heartleaf arnica, meadowrue, and bluebells are the prominent members. Sampled sites were on alluvium in the Wallowa Mountains at elevations of 6,500 and 6,700 ft.

Subalpine Fir-Engelmann Spruce/Twinflower *Abies lasiocarpa-Picea engelmannii/Linnaea borealis*

ABLA-PIEN/LIBO3 (n = 2)

This is a cold, moist canyon bottom community dominated by Engelmann spruce. Subalpine fir and spruce codominate the tree understory layers. An herbaceous ground cover dominated with heartleaf arnica and meadowrue highly associated. Twinflower, a subshrub, was prevalent among the forbs and indicated slightly drier, more aerated soils than was found beneath ABLA-PIEN/SETR communities. The communities were sampled in Hurricane Creek Canyon of the Wallowa Mountains at 6,100 to 6,200 ft elevation.

Subalpine Fir-Engelmann Spruce/Grouse Huckleberry-Pink Mountain Heath

Abies lasiocarpa-Picea engelmannii/Vaccinium scoparium-Phyllodoce empetriformis

ABLA-PIEN/VASC-PHEM (n = 1)

Glacially scoured cirque bottoms result in polished rocky outcrop ridgetops adjacent to soil-filled troughs. The bottom of the troughs in the Little Granite lakes basin often contained these communities. The sole soil studied consisted of loamy volcanic ash to a depth of more than 60 inches. Available water capacity was very high (about 13 inches), and pH ranged from 4.5 to 6.8. Subalpine fir and Engelmann spruce codominated all tree layers. Cold air-tolerant shrubs flourished and dominated. Grouse huckleberry and pink mountain heath covered 75% of the site. Herbaceous vegetation was scant. Among forbs associated were thick-leaved groundsel, subalpine daisy, and alpine hawkweed. Ross' sedge, Parry's rush, and smooth woodrush were the grasslike plants associated. The representative plot sampled was at 8,000 ft on greenstone in the Seven Devils Mountains.

Subalpine Fir-Engelmann Spruce/White Rhododendron

Abies lasiocarpa-Picea engelmannii/Rhododendron albiflorum

ABLA-PIEN/RHAL2 (n = 2)

These communities are extremely limited in the Elkhorn Mountains of eastern Oregon. Engelmann spruce, subalpine fir, and lodgepole pine occurred in the tree overstory layers. Spruce dominated all tree layers. Subalpine fir cover was greatest in the understory. White rhododendron and grouse huckleberry together constituted over 100% of shrub canopy cover. These cold, moist sites also contained pink mountain heath. Heartleaf arnica and sidebells pyrola were consistently present. Moss cover was high on the surface beneath the forest canopy. Sampled stands were early seral with Engelmann spruce (215 years) and lodgepole pine (200 years) dominating over younger aged subalpine fir. Elk use was high in these shady cool stands. The sampled plots were at 6,200 and 7,300 ft elevation on diorite.

Subalpine Fir-Engelmann Spruce/Smooth Woodrush *Abies lasiocarpa-Picea engelmannii/Luzula hitchcockii*

ABLA-PIEN/LUHI4 (n=1)

Subalpine fir and Engelmann spruce codominated tree overstory layers in an open stand near the upper slopes of cirque basins. Grouse huckleberry dominated exposed convex surfaces of hummocks, and smooth woodrush covered the concavities and flat surfaces beneath tree canopies. Forbs prevalent in the stand were subalpine daisy, heartleaf arnica, skunk-leaved polemonium, and sickletop lousewort. The representative plot sampled in this plant community was at 7,500 ft elevation on altered diorite in the Seven Devils Mountains.

**Subalpine Fir-Engelmann Spruce/Skunk-Leaved Polemonium
*Abies lasiocarpa-Picea engelmannii/Polemonium
pulcherrimum*
ABLA-PIEN/POPU3 (n = 2)**

Cold, dry canyon bottom or draw bottom sites were found in the Wallowa Mountains where subalpine fir and Engelmann spruce dominated all tree layers. The sole soil studied consisted of deep volcanic ash/loess over weathered bedrock, with high available water capacity (11 inches) and pH of 6.0 to 6.2. The profile consisted of silt loam to a depth of 28 inches, over gravelly to very gravelly silt loam, sandy, and silty clay loam. The dense tree overstory canopy (mean = 76%) created a depauperate ground cover. The most prominent shrub was mountain gooseberry. Forbs consistently found were skunk-leaved polemonium and Sitka valerian. Ross' sedge was present at low coverage. Sampled sites were on basaltic substrates at 6,600 and 7,000 ft elevation in the Wallowa Mountains. Elk use these communities for thermal cover.

SUBALPINE FIR VEGETATION

**Subalpine Fir/Twinflower Plant Association
Abies lasiocarpa/Linnaea borealis (ABLA/LIBO3)**



Lostine River Canyon, Wallowa Mountains, Early Seral Stage Plot 1381

Distribution - Wallowa Mountains (Minam River Canyon). Note: This plant association occurs frequently in the northern and central Blue Mountains and in the northern Wallowa Mountains. This description is for the subalpine of the Wallowa Mountains only in order to portray the type at its highest elevations.

Environmental features - The plots ranged from 5,800 to 5,950 ft in elevation. Sites were on ridgetop, convex to flat surfaces, on gentle slopes. Aspects were northerly. All plots were on basaltic substrates.

Soils - The sole soil profile studied consisted of a thick layer of volcanic ash with high organic matter content and high available water capacity. The profile was silt loam to a depth of greater than our observation depth (26 inches).

Vegetation composition - Engelmann spruce and subalpine fir occupied tree overstory layers with subalpine fir dominating. The tree understory was dominated by subalpine fir. Plots were located near mountain hemlock resulting in trace coverage by that species in the sapling and seedling stages. Shrubs were dominated by twinflower. Taller shrubs frequently occurring were grouse and big huckleberries, Utah honeysuckle, and prince's pine. Forbs were present in low coverages in this type. The more prominent were Piper's anemone, round-leaved violet, white hawkweed, heartleaf arnica, and sickletoad lousewort.

Successional relationships - Following fires, lodgepole pine pioneers with spruce. As the pine drops out, spruce assumes dominance and subalpine fir establishes. By late seral stages, subalpine fir dominates as Engelmann spruce becomes decadent. Big huckleberry and grouse huckleberry are prevalent in early seral stages, then decline as the tree overstory canopy closes.

Disturbance ecology - Subalpine fir and spruce are highly susceptible to mortality from fire. Elk use of the type is high. Stands provide key thermal cover and bedding in summer.

Relationship to other studies - Pfister et al. (1977) defined an ABLA/LIBO3 habitat type in western Montana; Steele et al. (1981) defined the type for west-central Idaho and for east-central Idaho and Wyoming (1983). Williams and Lillybridge (1983) classified vegetation of the Okanogan National Forest to the type. The ABLA/LIBO3 plant association is found on the Colville National Forest (Williams et al. 1990) and incidentally on the Wenatchee National Forest (Lillybridge et al. 1995). The ABLA/LIBO3 plant association has been previously described in the Wallowa Mountains (Johnson and Simon 1987) and in the Blue Mountains (Johnson and Clausnitzer 1992).

Table of Environmental Features

ABLA/LIBO3 (n = 2)

	MEAN		RANGE	
Elevation (ft)	5,915		5,880-5,950	
Slope (%)	5		5-5	
Aspect (no. of plots)	NW 0	NE 1	SE 1	SW 0
Geology	Basalt			
Position	Ridgetop			
Relief	Convex, flat			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
subalpine fir	ABLA	28	100	20-35
Engelmann spruce	PIEN	10	100	5-15
Tree Understory				
subalpine fir	ABLA	20	100	15-25
mountain hemlock	TSME	1	100	1-1
Shrubs				
grouse huckleberry	VASC	5	100	1-10
Utah honeysuckle	LOUT2	10	100	10-10
big huckleberry	VAME	20	50	0-20
prince's pine	CHUM	1	100	1-1
twinflower	LIBO3	35	100	25-45
Forbs				
heartleaf arnica	ARCO9	1	100	1-1
sidebells pyrola	PYSE	2	100	1-3
white hawkweed	HIAL	2	100	1-3
sickle-top lousewort	PERA	2	100	1-3
round-leaved violet	VIOR	2	100	1-3
rattlesnake plantain	GOOB2	1	100	1-1
Piper's anemone	ANPI	5	100	5-5

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	1	50	0-1
Rock	1	50	0-1
Gravel	0		0
Moss	20	100	5-35
Lichen	0		0
Litter	78	100	60-95

Subalpine Fir/Big Huckleberry Plant Association
***Abies lasiocarpa/Vaccinium membranaceum* (ABLA/VAME)**



Lake Fork Canyon, Wallowa Mountains Plot 1237

Distribution - Widely distributed throughout the Wallowa and Seven Devils Mountains. This description portrays ABLA/VAME at the highest elevations in the subalpine.

Environmental features - This subalpine fir plant association is usually found at lower montane elevations and warmer sites than ABLA/VASC plant association communities. Elevation ranged from 5,900 to 7,200 ft (mean = 6,500 ft). Sites were on all aspects with the majority of plots on north slopes. The communities were found on all ridgetop and slope positions on mostly concave relief. Slopes ranged from 10% to 70% (mean = 37%). Sites were on basaltic or granitic substrates.

Soils - Soils formed in moderately thick volcanic ash over colluvium or residuum from bedrock. Available water capacity is moderate to high, and rooting occurs throughout the volcanic ash layer. Profiles consist of an organic surface layer 0 to 5 inches thick (mean of 2 inches) over silt loam to a depth of 10 to 33 inches. Below this is very to extremely gravelly or stony silt loam, loam, or silty clay loam, generally to a depth below our observations to 3 or 4 ft. (N = 7).

Vegetation composition - Late to mid seral stands were codominated by subalpine fir and Engelmann spruce. Lodgepole pine frequently occurred as old decadent pioneers. Tree understory layers were dominated by subalpine fir with Engelmann spruce usually present at low coverages. Older trees (pioneers following fire) averaged 205 years)

(lodgepole pine and 330 years (Douglas-fir) in the sampled stands. Engelmann spruce ages averaged 148 years, whereas subalpine fir averaged 122 years. Big huckleberry dominated the understory of the stands with the pioneering grouse huckleberry usually occurring at lower levels of cover. Prince's pine, heartleaf arnica, sidebells pyrola, round-leaved violet, skunk-leaved polemonium, and sickletop lousewort were consistently present in mid to late seral stands.

Successional relationships - Early seral stands were usually dominated by lodgepole pine, larch, Douglas-fir, or grand fir as species adapting to the warmer conditions following stand-replacement fires. Tree understory layers were usually a mix of lodgepole pine and subalpine fir with spruce. Grouse huckleberry was often codominant with big huckleberry. Reflecting warmer conditions of early seral sites, birchleaf spiraea was often present. The open canopies of early seral stages permitted currents/gooseberries, Sitka alder, and creeping Oregon-grape to provide dominance beneath larch, Douglas-fir, and grand fir-dominated stands assigned to the ABLA/VAME plant association. Columbia brome, pinegrass, and elk sedge were often present at lower coverages. As the succession advances following disturbances, big huckleberry cover declines with canopy closure and cooling of the ground surface. Shade-tolerant plants like Prince's pine, pyrolas, and violets become more prevalent. At the lower elevations, where moisture is more limiting, big huckleberry persists only on concavities, whereas the more drought-tolerant grouse huckleberry occupies convex surfaces.

Disturbance ecology - Fire is the primary disturbance event in these communities. Stand-replacement fires create early seral communities of lodgepole pine. Western larch-dominated stands are prevalent in this type when sites are on steep montane slopes. Lodgepole pine-dominated early seral stands generally occur on slopes less than 20%. Douglas-fir and grand fir will occupy early seral communities on steep slopes where seed sources from adjacent older trees create an even-aged stand. Elk use these communities and can have high impacts on the sites. Elk bedding and ground disturbance from trampling promote patches of weedy vegetation to develop. Examples of aggressive plants occupying these disturbed areas in ABLA/VAME are meadowrue, bigleaf sandwort, and stinging nettle.

Relationship to other studies - Hall (1973) described ABLA/VAME in the Blue Mountains. The plant association was described in the Wallowa (Johnson and Simon 1987) and Blue Mountains (Johnson and Clausnitzer 1992). A similar type occurs in central and eastern Idaho (Steele et al. 1981, 1983) where *Vaccinium globulare* is an ecologic equivalent to *V. membranaceum*. Williams et al. (1990) found ABLA/VAME on the Colville National Forest. Lillybridge et al. (1995) described ABLA/VAME on the Wenatchee National Forest.

Table of Environmental Features
ABLA/VAME (n = 20)

	MEAN		RANGE			
Elevation (ft)	6,390		5,870-7,230			
Slope (%)	31		3-60			
Stand age (years)						
	ABLA	122	101-150			
	PIEN	148	114-208			
	PSME	221	111-330			
	PICO	146	98-205			
Aspect (no. of plots)	NW 3	NE 9	SE 6	SW 2		
Geology	Basalt, granodiorite, dacite, quartz diorite					
Position	All					
Relief	Convex, concave (mostly concave)					

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	t	35	0-1
Rock	5	45	0-45
Gravel	1	15	0-15
Moss	14	95	0-50
Lichen	t	40	0-1
Litter	77	100	35-95

Table of Principal Species (Cover/Constancy - %)

SPECIES	CODE	Mid to Late Seral (n=14)	Early Seral PICO (n=6)	Early Seral LAOC (n=1)	Early Seral PSME (n=2)	Early Seral ABGR (n=1)
Tree Overstory						
subalpine fir	ABLA	21/100	5/50		1/50	3/100
Engelmann spruce	PIEN	15/86	2/33			
lodgepole pine	PICO	2/43	15/67	3/100	1/50	8/100
western larch	LAOC		1/33	20/100		
Douglas-fir	PSME			3/100	53/100	
grand fir	ABGR					35/100
Tree Understory						
subalpine fir	ABLA	17/100	14/100	5/100	3/100	30/100
Engelmann spruce	PIEN	3/79	3/50		2/50	
lodgepole pine	PICO		14/50	5/100		1/100
western larch	LAOC			5/100		
Douglas-fir	PSME				3/50	
grand fir	ABGR		3/50		3/50	1/100
Shrubs						
big huckleberry	VAME	42/100	37/100	1/100	26/100	20/100
prince's pine	CHUM	2/64	4/83	1/100	3/100	1/100
grouse huckleberry	VASC	8/71	30/67			
Utah honeysuckle	LOUT2	1/50	3/67		2/50	
birchleaf spiraea	SPBE2		2/67	1/100	1/50	
Sitka alder	ALSI3			60/100		
gooseberries/currents	RIBES			5/100	1/50	
creeping Oregon-grape	BERE					10/100
Grasses						
Columbia brome	BRVU	1/29		3/100	1/50	5/100
pinegrass	CARU		2/67		3/50	1/100
Grasslikes						
Ross' sedge	CARO5	1/36	1/33	1/100	1/50	
elk sedge	CAGE2				8/50	1/100
Forbs						
heartleaf arnica	ARCO9	9/86	3/33	25/100	1/100	1/100
sidebells pyrola	PYSE	3/86		20/100	3/50	1/100
sicketop lousewort	PERA	3/57			1/50	
round-leaved violet	VIOR	4/50	1/33	5/100	1/50	1/100
skunk-leaved polemonium	POPU3	1/50	2/33		1/50	1/100
Sitka valerian	VASI	2/43			1/50	1/100
rattlesnake plantain	GOOB2	1/43	1/67	1/100	1/50	
white-vein pyrola	PYPI2		1/50			
meadowrue	THOC		1/33	75/100	1/50	1/100
Piper's anemone	ANPI			5/100		
sweet cicely	OSCU			5/100		1/100
woods strawberry	FRVE					5/100

Subalpine Fir/Grouse Huckleberry-Pink Mountain Heath Plant Association

Abies lasiocarpa/Vaccinium scoparium-Phyllodoce empetriformis (ABLA/VASC-PHEM)



Near Pocket Lake, Eagle Cap Wilderness, Wallowa Mountains Plot 6024

Distribution - Wallowa Mountains (cirque lake basins).

Environmental features - Prominent in cold air ponding basins from 7,200 to 8,300 ft elevation in the Wallowa Mountains. Generally found on concave to undulating granitic surfaces and on nearly all aspects and topographic positions. A common location for this community is in the granitic trough scoured by glacial ice.

Soils - The two soils studied formed in volcanic ash over granodiorite. A surface mantle of loam or sandy loam extended to a depth of at least 16 inches in one profile and 30 inches in the other. (N = 2).

Vegetation composition - The proximity to whitebark pine communities provides high frequency of occurrences within this type by the pine. However, subalpine fir dominated the tree overstory and tree understory layers. Lodgepole pine and Engelmann spruce may be associated in earlier seral stands. Two cold-tolerant shrubs dominate these sites, pink mountain heath and grouse huckleberry. Herbaceous vegetation showing prominence were Ross' sedge, Parry's rush, alpine daisy, woolly pussytoes, and arnica (heartleaf and hairy). Subalpine fir ages ranged from 70 to 103.

Successional relationships - Stands of subalpine fir tended to be even aged suggesting stand-replacing fire had initiated their establishment. Lodgepole pine and Engelmann spruce were pioneers on some sites; whitebark pine on others. Whitebark pines occupied fissures in granitic outcrops; subalpine fir occupied soils in the troughs.

Disturbance ecology - These high-elevation sites are infrequently burned. When ignited, the stand usually is replaced. Little used by deer, elk, or goats.

Relationship to other studies - Williams and Lillybridge (1983) described ABLA/PHEM on the Okanogan National Forest that appears similar to this plant association. The ABLA/VASC-PHEM plant association has not been previously described for the Wallowa Mountains.

**Table of Environmental Features
ABLA/VASC-PHEM (n = 7)**

	MEAN		RANGE	
Elevation (ft)	7,564		7,200-8,300	
Slope (%)	28		4-75	
Aspect (no. of plots)	NW 2	NE 0	SE 2	SW 3
Geology	Granitic			
Position	Slopes - lower 1/3, upper 1/3; edge of basins			
Relief	Concave, undulating			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
subalpine fir	ABLA	18	86	0-35
whitebark pine	PIAL	14	57	0-25
lodgepole pine	PICO	4	43	0-65
Tree Understory				
subalpine fir	ABLA	16	100	5-40
whitebark pine	PIAL	1	57	0-1
Engelmann spruce	PIEN	4	43	0-5
lodgepole pine	PICO	16	29	0-30
Shrubs				
grouse huckleberry	VASC	54	100	20-80
pink mountain heath	PHEM	13	100	5-25
Grasslikes				
Ross' sedge	CARO5	1	71	0-3
Parry's rush	JUPA	7	71	0-15
woodrush	LUZULA	3	29	0-5
Forbs				
arnica	ARNIC	2	57	0-10
Sitka valerian	VASI	3	29	0-5
subalpine daisy	ERPE3	2	86	0-3
Gray's licoriceroot	LIGR	2	43	0-3
green false hellebore	VEVI	6	29	0-10
woolly pussytoes	ANLA3	7	86	0-25
Cusick's speedwell	VECU	1	43	0-1

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	2	86	0-5
Rock	14	86	0-40
Gravel	1	29	0-3
Moss	6	71	0-15
Lichen	1	29	0-1
Litter	57	100	30-90

Subalpine Fir/Grouse Huckleberry Plant Association
Abies lasiocarpa/Vaccinium scoparium (ABLA/VASC)



Near Mormon Boy Mine, Elkhorn Mountains Plot 8523

Distribution - The most commonly occurring plant association in the subalpine forests of the Blue, Wallowa, and Seven Devils Mountains. Note: This description portrays the upper elevation (subalpine) characteristics of ABLA/VASC. It has previously been described over a broader area in northeast Oregon.

Environmental features - This ubiquitous type was found on many different substrates. The following rocks were formative to parent materials on which ABLA/VASC was found: andesite, basalt, tuff, granite, quartz, quartz diorite, granodiorite, and peridotite. Elevations ranged from 5,600 to 8,200 ft (mean = 7,075 ft). Sites were on all topographic positions (slopes and ridgetops). It occurs on moderate to steep slopes (5 to 70%; mean = 30%). This type occurs on all aspects with northerly aspects favored (northeast aspects dominated). Surfaces were mostly convex or flat.

Soils - Soils have formed in a moderately thick layer of volcanic ash over loamy-skeletal residuum from bedrock or colluvium. Soil pH can be rather acidic in weathered granitic rocks but is generally in the 6 to 7 range in the ash layer, the zone of rooting concentration. Available water capacity is moderate to high. Profiles consist of silt loamy or gravelly silt loam down to 10 to 34 inches deep, over very to extremely cobbly or stony loamy soil. Bedrock was encountered in some profiles at a depth of 34 inches or more, but was often below the depth of observation. An organic surface layer up to 2 inches thick was present in some profiles. (N = 15).

Vegetation composition - In mid to late seral stands subalpine fir and Engelmann spruce usually codominated the upper tree canopy layers. Lodgepole pine was usually decadent and occasional. Tree understory layers were dominated by subalpine fir poles, saplings, and seedlings. Grouse huckleberry totally dominated the ground cover. The only exceptions were late seral stands where crown closure diminished sunlight and eliminated the sun-loving huckleberry. Ross' sedge was highly present as the most common herbaceous plant. Elk sedge occurred occasionally except in the Seven Devils Mountains where it was absent from these communities. The most common forbs associated in ABLA/VASC are heartleaf arnica, Sitka valerian, skunk-leaved polemonium, and sickletop lousewort (skunk-leaved polemonium and Sitka valerian were scarce in the Elkhorns). The Seven Devils communities had a high frequency of occurrence by tailcup lupine, Sitka valerian, and sickletop lousewort. The Strawberry Mountains plots had the highest occurrence by Oregon box myrtle and Gray's licoriceroot of all mountain samples. Tree ages for sampled stands averaged 150 years for subalpine fir and 190 years for Engelmann spruce. Lodgepole pine averaged 110 years of age in mid to late seral stands.

Successional relationships - Lodgepole pine and Engelmann spruce are pioneers following stand-replacing disturbances. Engelmann spruce in sampled stands averaged 40 years older than the associated subalpine fir. Early seral stands sampled were dominated by lodgepole pine in the tree overstory layer but were dominant or codominant with subalpine fir in the tree understory. Engelmann spruce was often present as an advanced age class over subalpine fir. Owing to high light infiltration through the lodgepole canopies, grouse huckleberry was the dominant ground cover with coverage as high as 85%. Forbs that indicated early seral stages of ABLA/VASC were white hawkweed, heartleaf arnica, and pearly everlasting. Lodgepole pine stand age averaged 99 years on sampled early seral stage plots. At the higher elevation interface with whitebark pine communities, early seral ABLA/VASC sites will contain whitebark pine pioneers. As crown canopy closure eliminates sunlight, grouse huckleberry cover is significantly lessened with Sitka valerian and sidebells pyrola enhanced owing to the cold, low light environment. Many late seral ABLA/VASC stands are devoid of grouse huckleberry owing to retardation of light by the tree overstory canopy.

Disturbance ecology - Ungulates tend to spend little time in these communities. Deer used some sites for bedding, but generally ABLA/VASC stands are used for escape cover. Oregon box myrtle was heavily browsed by deer in the Strawberry Mountains. Elk use was also limited in these stands as areas for thermal cover. Fire replaces these stands with even-aged stand structures of subalpine fir following lodgepole pine, Engelmann spruce, and whitebark pine at higher elevations. Heartleaf arnica often increases after moderate to severe burns in this type. Grouse huckleberry sprouts following fire.

Relationship to other studies - The ABLA/VASC plant association is found throughout the Intermountain Pacific Northwest at higher montane elevations. Hall (1973) described it in the Blue Mountains, Pfister et al. (1977) found it in western Montana; Steele et al. (1981, 1983) found it in central Idaho, eastern Idaho, and western Wyoming; Williams and Lillybridge (1983) found it in the Okanogan Highlands; Williams et al. (1990) described it on the Colville National Forest; Cooper et al. (1991) classified it in northern Idaho; and Lillybridge et al. (1995) found it on the Wenatchee National Forest. This plant association was previously described by Johnson and Simon (1987) in the Wallowa and Seven Devils Mountains as ABLA/VASC/POPU3 and by Johnson and Clausnitzer (1992) in the Blue Mountains as ABLA/VASC.

Mid to Late Seral Stands (Subalpine Fir/Grouse Huckleberry)

**Table of Environmental Features
ABLA/VASC (mid to late seral) (n = 37)**

	MEAN		RANGE	
Elevation (ft)	7,075		5,610-8,160	
Slope (%)	30		5-70	
Soil pH			5.0-6.5	
Soil available water capacity (inches)			7-11 inches (moderate to high)	
Thickness of volcanic ash mantle			10-34 inches	
Depth to bedrock (inches)			34 to more than 50	
Aspect (no. of plots)	NW 10	NE 15	SE 7	SW 5
Geology	Andesite, quartz diorite, granite, basalt, granodiorite, peridotite, tuff			
Position	All			
Relief	All (mostly convex, flat)			

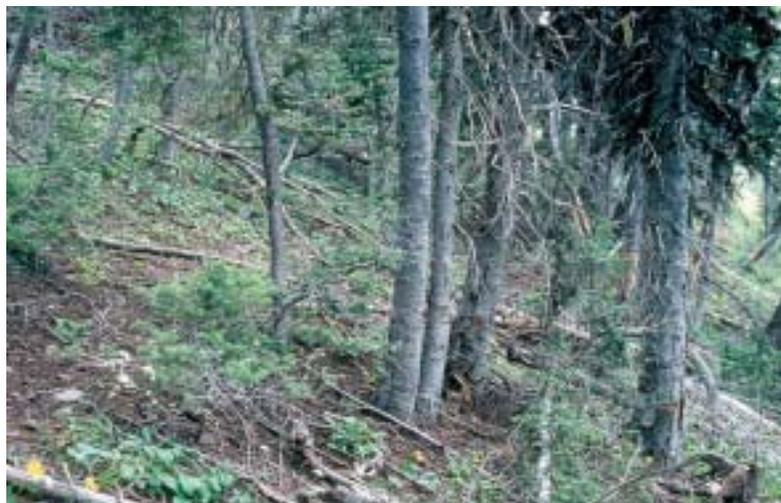
Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
subalpine fir	ABLA	16	86	0-50
Engelmann spruce	PIEN	11	59	0-50
lodgepole pine	PICO	2	41	0-30
Tree Understory				
subalpine fir	ABLA	23	100	0-65
Engelmann spruce	PIEN	2	51	0-25
lodgepole pine	PICO	1	24	0-6
Shrubs				
grouse huckleberry	VASC	19	92	0-90
Utah honeysuckle	LOUT2	1	27	0-3
Grasslikes				
Ross' sedge	CAR05	1	62	0-5
elk sedge	CAGE2	1	30	0-3
Forbs				
Sitka valerian	VASI	2	62	0-10
heartleaf arnica	ARCO9	4	59	0-30
skunk-leaved polemonium	POPU3	1	49	0-5
sickletop lousewort	PERA	2	46	0-30
white hawkweed	HAL	1	32	0-3
sidebells pyrola	PYSE	1	24	0-5
Gray's licoriceroot	LIGR	1	27	0-1
subalpine daisy	ERPE3	1	30	0-10
green false hellebore	VEVI	1	24	0-10

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	2	57	0-10
Rock	10	69	0-35
Gravel	2	49	0-15
Moss	13	92	0-65
Lichen	1	27	0-10
Litter	67	95	3-99

Subalpine Fir/Heartleaf Arnica Plant Association
Abies lasiocarpa/*Arnica cordifolia* (ABLA/ARCO9)



Near Fields Peak, Aldrich Mountains Plot 8812

Distribution - Wallowa, Seven Devils, Strawberry, and Aldrich Mountains.

Environmental features - This type was found on basalts, andesites, granodiorite, and diorite. It also occurred on siltstones and limestones. Elevations ranged from 6,100 to 7,500 ft (mean = 6,900 ft). Slopes were gentle to steep (mean = 35%). It was found on all aspects at primarily ridgetop and upper slope positions on convex or flat surfaces.

Soils - Soils have formed in a thin to moderately thick layer of volcanic ash over gravelly colluvium. They have moderate to high available water capacity, and bedrock was below our depth of observation. Profiles have a surface organic layer 1 to 3 inches thick, over gravelly silt loam or gravelly loam to a depth of 5 to 25 inches. Below this is very gravelly or very cobbly loamy soil. (N = 4).

Vegetation composition - Late to mid seral stands contained subalpine fir, Engelmann spruce, lodgepole pine, and Douglas-fir. Subalpine fir dominated all tree layers. Shrubs were minor with only grouse huckleberry and Utah honeysuckle frequently associated. The undergrowth was dominated by heartleaf arnica. Other forbs of note were skunk-leaved polemonium, sidebells pyrola, Sitka valerian, meadowrue, white hawkweed, and round-leaved violet.

Successional relationships - Douglas-fir was the most prominent pioneering tree species after fires. Engelmann spruce also preceded the establishment by subalpine fir in succession following fire. Average ages for sampled stands were Douglas-fir (237 years) and Engelmann spruce (183 years). Sampled mid to late seral stands averaged 143 years for subalpine fir. In early seral stands, even-aged subalpine fir (mean = 70 years) was associated with lodgepole pine (105 years) and Douglas-fir (77 years) following stand-replacement fire.

Disturbance ecology - Heartleaf arnica is prone to increase following moderate underburns and severe stand-replacement fires. Fire can underburn, patch-mosaic burn, or stand-replace burn in this plant association. Domestic sheep overgrazing has resulted in patches of meadowrue, sweet cicely, and bigleaf sandwort where the ground has been highly disturbed. Deer bed and trail through these communities. Severely hedged sticky current was attributed to deer browsing. Elk also frequent these communities for thermal cover.

Relationship to other studies - This type was not described in the Blue or Wallowa Mountains by Hall (1973) or Johnson and Simon (1987). It was first described by Pfister et al. (1977) in western Montana. Steele et al. (1981, 1983) found it in central and eastern Idaho and western Wyoming. An ABLA/ARCO9 seral plant community was assigned to the ABLA/TRCA plant association by Johnson and Clausnitzer (1992) for the Blue and Ochoco Mountains. This is the first description on ABLA/ARCO9 for the subalpine of northeast Oregon.

Table of Environmental Features
ABLA/ARCO9 (n = 13)

	MEAN	RANGE
Elevation (ft)	6,893	6,100-7,500
Slope (%)	35	3-80
Soil pH		5.8-6.6
Soil available water capacity (inches)		5-10 inches (moderate to high)
Thickness of volcanic ash mantle	14 inches	5-26 inches
Stand age (years)		
	ABLA 143	112-212
	PSME 237	130-274
	PIEN 183	171-194
	PICO 144	128-168
Aspect (no. of plots)	NW 2 NE 6 SE 1 SW 4	
Geology	Basalt, limestone, granodiorite, andesite, diorite, siltstone	
Position	Ridgetops, upper and mid slopes	
Relief	Convex, flat	

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
subalpine fir	ABLA	21	85	0-45
Engelmann spruce	PIEN	6	54	0-25
lodgepole pine	PICO	4	54	0-15
Douglas-fir	PSME	18	54	0-75
Tree Understory				
subalpine fir	ABLA	25	100	3-45
Douglas-fir	PSME	6	38	0-45
Shrubs				
grouse huckleberry	VASC	1	54	0-3
Utah honeysuckle	LOUT2	1	54	0-1
Grasses & Grasslikes				
Ross' sedge	CARO5	1	46	0-1
pinegrass	CARU	1	23	0-15
Forbs				
heartleaf arnica	ARCO9	12	100	1-25
skunk-leaved polemonium	POPU3	2	62	0-10
Sitka valerian	VASI	4	62	0-20
sidebells pyrola	PYSE	1	69	0-5
meadowrue	THOC	6	54	0-25
white hawkweed	HIAL	1	46	0-1
sweet cicely	OSCH	1	46	0-10
round-leaved violet	VIOR	2	46	0-15
Piper's anemone	ANPI	2	23	0-10
bigleaf sandwort	ARMA18	1	38	0-1

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	1	42	0-3
Rock	3	58	0-10
Gravel	4	33	0-25
Moss	5	83	0-20
Lichen	1	33	0-1
Litter	85	100	65-95

Subalpine Fir/Pinegrass Plant Association
***Abies lasiocarpa/Calamagrostis rubescens* (ABLA/CARU)**



Lick Creek, Wallowa Mountains, Early Seral Stage Plot 879

Distribution - Wallowa, Seven Devils, and Strawberry Mountains.

Environmental features - This type was found at low subalpine elevations (5,640 to 6,950 ft; mean = 6,500 ft) on basaltic and granitic (quartz diorite) substrates. All sampled plots were on southerly exposures on ridgetops, upper slopes, and lower slopes. Convex, flat, or undulating surfaces carried the pinegrass-dominated vegetation. Slopes ranged from 12% to 40% (mean = 24%).

Soils - The two profiles studied were rather different. One was in deep volcanic ash or loess (silt loam to a depth of more than 78 inches), with a very high available water capacity (13 to 14 inches). The other was formed in residuum from bedrock, with very gravelly silt loam to a depth of 15 inches over very cobbly silty clay loam; this soil had a moderate available water capacity (about 5 inches). Soil pH was 5.8 to 6.2. (N = 2).

Vegetation composition - The sampled stands were predominantly early seral with lodgepole pine dominating tree overstory layers. Often Douglas-fir and western larch were associated with subalpine fir. Tree understories were codominated by lodgepole pine and subalpine fir. In late seral stands, subalpine fir dominated all tree layers with lodgepole pine relict from earlier dominance. Shrubs and forbs were subordinate to the dominance by pinegrass (up to 85% coverage). Ross' sedge, white and yellow hawkweeds, and heartleaf arnica were the more frequently found herbaceous plants occurring in the pinegrass-dominated herbaceous layer.

Successional relationships - As succession advances, fire pioneer tree species (lodgepole pine, larch, Douglas-fir) lose stand dominance to subalpine fir. Lodgepole pine averaged 37 years older (107 years) than subalpine fir (70 years) in early seral sampled stands. Paralleling the increased crown closure by trees is a diminishing of pinegrass cover. In late seral stands, pinegrass is relict (often less than 5%) with shade-tolerant plants being more prominent (e.g., sidebells pyrola, bigleaf sandwort).

Disturbance ecology - These communities receive low usage by ungulates owing to the low palatability of pinegrass. In the subalpine, these communities frequently occur on narrow ridgetops where domestic sheep once trailed along "driveways" annually. Tailcup lupine and Rocky Mountain butterweed increase and can dominate following severe disturbances. Fires have historically underburned providing Douglas-fir dominance in these communities. When severely burned, lodgepole and larch are early seral pioneering tree species that proliferate.

Relationship to other studies - An ABLA/CARU plant community type was described by Johnson and Simon (1987) in the Wallowa and Seven Devils Mountains. Other investigators have described similar communities. Steele et al. (1981) also found ABLA/CARU dominated by seral Douglas-fir on warmer sites in the subalpine fir zone of central Idaho where lodgepole pine was a principal seral component. Pfister et al. (1977) described a similar vegetation in western Montana where wildfires had periodically eliminated spruce and true firs, but Douglas-fir had persisted. Other ABLA/CARU plant associations have been described by Williams and Lillybridge (1983) on the Okanogan National Forest, Williams et al. (1990) on the Colville National Forest, Lillybridge et al. (1995) on the Wenatchee National Forest, and Steele et al. (1983) in southeast Idaho and western Wyoming.

Table of Environmental Features
ABLA/CARU (n = 5)

	MEAN			RANGE				
Elevation (ft)	6,458			5,640-6,950				
Slope (%)	24			12-40				
Aspect (no. of plots)	NW	0	NE	0	SE	4	SW	1
Geology	Basalt, quartz diorite							
Position	Ridgetop, upper 1/3 and lower 1/3 slopes							
Relief	Concave, flat, and undulating							

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
subalpine fir	ABLA	12	20	0-60
lodgepole pine	PICO	12	80	0-25
Douglas-fir	PSME	14	40	0-45
western larch	LAOC	9	40	0-40
Tree Understory				
subalpine fir	ABLA	6	100	3-10
lodgepole pine	PICO	5	100	1-10
Douglas-fir	PSME	1	40	0-1
Shrubs				
gooseberries/currents	RIBES	1	40	0-5
creeping Oregon-grape	BERE	2	40	0-10
Grasses				
pinegrass	CARU	47	100	3-85
Grasslikes				
Ross' sedge	CARO5	1	60	0-3
elk sedge	CAGE2	2	40	0-10
Forbs				
heartleaf arnica	ARCO9	2	40	0-10
hawkweed	HIERA	2	60	0-5
tailcup lupine	LUCA	8	20	0-40
sidebells pyrola	PYSE	1	40	0-1
fireweeds	EPILOB	1	60	0-1

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	0	0	0
Rock	2	60	0-5
Gravel	0	0	0
Moss	1	60	0-1
Lichen	0	0	0
Litter	93	100	90-95

Subalpine Fir/Elk Sedge Plant Association
Abies lasiocarpa/Carex geyeri (ABLA/CAGE2)



Indian Spring Butte, Strawberry Mountains Plot B0553

Distribution - Elkhorn, Greenhorn, Strawberry, and Wallowa Mountains.

Environmental features - A low-elevation subalpine type (6,800 to 7,800 ft; mean = 7,262 ft) occurring on basalts, andesites, granites, and tuffs. The majority of the sampled sites were on southerly gentle to steep slopes (mean = 28%), on ridgetops, or at upper or middle slope positions. Relief was flat, concave, or convex.

Vegetation composition - Douglas-fir is a pioneer in this type and dominated late to mid seral stands in overstory canopy layers. In the tree understory layers, subalpine fir dominated with Douglas-fir seedlings and saplings usually present at lower coverages. Reflecting the relatively warm, dry microenvironment were grasses and sedges capable of sustaining late-season drought. Elk sedge was dominant (mean = 27%) on the gravelly soils. Also associated were Ross' sedge, western needlegrass, and bottlebrush squirreltail. Forbs associated with the sedge-grass community were also plants capable of surviving dry, warm, late summer drought (e.g., phlox, prickly sandwort, bigleaf sandwort).

Successional relationships - Douglas-fir has historically survived infrequent underburns to strongly establish on these sites. With fire retardation, and larger intervals between fires, subalpine fir is capable of establishing under the cooler, shaded canopies provided by the Douglas-fir. Mid seral stands were usually dominated by Douglas-fir in the overstory but by subalpine fir in the tree understory.

Disturbance ecology - Bigleaf sandwort and sweet cicely are increasers with surface disturbance. Elk, cattle, deer, and domestic sheep have created disturbances for these species to form patches beneath the old-growth Douglas-fir trees.

Relationship to other studies - Pfister et al. (1977) described an ABLA/CAGE2 habitat type with two phases (CAGE2 and PSME) in western Montana. Steele et al. (1981) also described an ABLA/CAGE2 habitat type with two phases (CAGE2 and ARTRV) in central Idaho. Pfister's PSME phase and Steele's ARTRV phase best fit the ABLA/CAGE2 described in this study. This plant association was previously described in the Blue and Ochoco Mountains (Johnson and Clausnitzer 1992).

Table of Environmental Features
ABLA/CAGE2 (n = 14)

	MEAN		RANGE			
Elevation (ft)	7,315		6,840-7,800			
Slope (%)	28		4-50			
Aspect (no. of plots)	NW 0	NE 3	SE 1	SW 10		
Geology	Granite, andesite, basalt, tuff					
Position	Ridgetop, upper 1/3 & mid 1/3 slopes					
Relief	Convex, flat, concave					

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
subalpine fir	ABLA	14	50	0-50
Douglas-fir	PSME	41	75	0-65
Tree Understory				
subalpine fir	ABLA	8	100	5-20
Douglas-fir	PSME	2	50	0-6
Shrubs				
mountain big sagebrush	ARTRV	2	29	0-20
mountain gooseberry	RIMO2	2	43	0-15
Grasses				
western needlegrass	STOC	6	57	0-60
mountain brome	BRCA5	1	14	0-1
bottlebrush squirreltail	SIHY	3	43	0-40
Grasslikes				
elk sedge	CAGE2	27	100	3-95
Ross' sedge	CARO5	3	50	0-20
Forbs				
sweet cicely	OSCH	1	14	0-10
bigleaf sandwort	ARMA18	5	21	0-60
penstemons	PENST	1	29	0-3
alpine fleecflower	POPH	1	21	0-7
hawkweeds	HIERA	1	43	0-7
phlox	PHLOX	3	57	0-20
prickly sandwort	ARAC2	1	29	0-7

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	9	71	0-45
Rock	3	71	0-10
Gravel	11	57	0-50
Moss	0	0	0
Lichen	0	0	0
Litter	19	29	0-99

Subalpine Fir/Skunk-Leaved Polemonium Plant Association
***Abies lasiocarpa/Polemonium pulcherrimum* (ABLA/POPU3)**



Near Potato Hill, Seven Devils Mountains Plot 7016

Distribution - Seven Devils and Strawberry Mountains.

Environmental features - Communities assigned to this type occur in cold, dry environments; often at the upper limits of the subalpine fir zone. Sampled sites occurred on basaltic, andesitic, and granitic substrates from 7,000 to 7,600 ft elevation (mean = 7,276 ft). Slopes ranged from moderate (14%) to steep (70%) with plots occurring on all slope positions. Surfaces were flat, convex, or undulating.

Vegetation composition - Tree overstories and understories were dominated by subalpine fir in mid to late seral stands. Douglas-fir, Engelmann spruce, and lodgepole pine were occasionally found in tree overstory layers as well. Subalpine fir ages ranged from 84 to 197 years in sampled stands. The ground cover was usually depauperate with litter dominating. The indicator for this type was the cold and drought-tolerant skunk-leaved polemonium. Other forbs usually associated were Sitka valerian and heartleaf arnica. Utah honeysuckle commonly occurred at low coverage.

Successional relationships - Lodgepole pine pioneers on these sites following replacement burns.

Disturbance ecology - On steeper slopes where instability occurs from gravity-fed surface movement and avalanches, these communities are often highly exposed to desiccating winds and high solar radiation. Bigleaf sandwort, butterweed, subalpine daisy, and polemonium are all capable of establishing on the harsh sites. Ungulates trail through these communities.

Relationship to other studies - This plant association was first described by Johnson and Simon (1987) in the Seven Devils Mountains as a plant community type. There it was found on steep, cold sites with unstable surface soils. This description is for the type as a plant association in the subalpine.

Table of Environmental Features
ABLA/POPU3 (n = 5)

	MEAN		RANGE	
Elevation (ft)	7,276		6,970-7,620	
Slope (%)	44		14-70	
Aspect (no. of plots)	NW 3	NE 0	SE 2	SW 0
Geology	Andesite, basalt, quartz diorite			
Position	Slopes (upper, mid, and lower)			
Relief	Convex, flat, undulating			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
subalpine fir	ABLA	29	100	10-45
Engelmann spruce	PIEN	15	20	0-15
lodgepole pine	PICO	5	20	0-5
Douglas-fir	PSME	25	40	0-40
Tree Understory				
subalpine fir	ABLA	20	100	1-30
lodgepole pine	PICO	18	20	0-18
Shrubs				
Utah honeysuckle	LOUT2	1	60	0-1
Forbs				
heartleaf arnica	ARCO9	2	60	0-3
Sitka valerian	VASI	3	60	0-5
skunk-leaved polemonium	POPU3	5	100	1-15

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	3	60	0-10
Rock	5	80	0-15
Gravel	2	100	1-5
Moss	12	60	0-50
Lichen	0	0	0
Litter	71	100	35-99

SUBALPINE FIR COMMUNITIES

Subalpine Fir-Western White Pine/Prince's Pine
Abies lasiocarpa-Pinus monticola/Chimaphila umbellata
ABLA-PIMO3/CHUM (n = 2)

These western white pine-dominated communities are early and mid seral representatives of subalpine fir/grouse huckleberry plant associations. In early seral stands, white pine and Douglas-fir dominate the tree overstory with subalpine fir dominating the tree understory. In mid seral stands, white pine and subalpine fir codominate the tree overstory with subalpine fir totally dominating the seedling and sapling layers. Shrubs and forbs were low in coverage beneath the dense tree canopy layers. Prince's pine and sidebells pyrola were always present. On one plot, the effects of historical domestic sheep overgrazing had allowed western bistort to invade and totally dominate. On the other plot, Oregon box myrtle was a significant component. Elk and deer had severely hedged Oregon box myrtle plants. Sampled sites were in the Strawberry Mountains on northerly steep slopes at 6,800 to 6,900 ft elevation. The communities were growing on peridotite and basalt.

Subalpine Fir/Beargrass
Abies lasiocarpa/Xerophyllum tenax
ABLA/XETE (n = 1)

This community occurs in the Seven Devils Mountains where beargrass is occupying the extreme southwesterly portion of its range in the northern Rocky Mountains. The sampled plot occurred in the Sheep Lake cirque at 7,900 ft on concavities where cold, moist conditions prevail. The soil here was formed in mixed volcanic ash and colluvium over bedrock: cobbly loam and silt loam to a depth of 12 inches, over very cobbly and very gravelly sandy loam and loamy sand, over bedrock at 37 inches. Available water capacity was low (about 4 inches) as was soil pH (4.3 to 5.0). Subalpine fir and Engelmann spruce overstory were 175 years old. Subalpine fir alone dominated the tree understory. Grouse huckleberry and beargrass dominated the undergrowth. Grouse huckleberry occupied drier, convex surfaces on the site.

Subalpine Fir/Pinemat Manzanita/Prickly Sandwort
Abies lasiocarpa/Arctostaphylos nevadensis/Arenaria aculeata
ABLA/ARNE/ARAC2 (n = 1)

This ultramafic community occurred on peridotite in the Strawberry Mountains. It was dominated by lodgepole pine in all tree layers. In the absence of fire, subalpine fir was succeeding. The 80-year-old lodgepole pine stand represented an early seral stage occupying upper slopes on convex surfaces. Pinemat manzanita codominated the undergrowth with prickly sandwort. Other plants with prominence were linanthastrum, Wheeler's bluegrass, woolly sunflower, and woolly groundsel.

Subalpine Fir/Green Fescue
Abies lasiocarpa/Festuca viridula
ABLA/FEVI (n = 2)

These were lodgepole pine-dominated stands succeeding to subalpine fir in the southern Wallowa Mountains. These very early seral stands occupied the green fescue grassland in savannah formation. The sites were at 7,100 ft elevation on andesites. The sole soil studied was deep and consisted of mixed volcanic ash and loess over colluvium over bedrock, with high available water capacity (9 to 10 inches) and rather low pH (5.0 to 6.4). The profile consisted of a loamy mantle to 30 inches deep over very gravelly loam, with bedrock at 44 inches deep. Many of these communities were heavily used historically by domestic sheep. On less degraded sites, green fescue dominated the undergrowth with Ross' sedge. On more disturbed sites, lupine, Hood's sedge, yarrow, and globe penstemon dominated over the fescue.

Subalpine Fir/Alpine Fleecflower
Abies lasiocarpa/Polygonum phytolaccaefolium
ABLA/POPH (n=1)

This community is degenerated from a site once capable of supporting Idaho fescue. Past domestic sheep overgrazing has resulted in a soil loss of 3 to 8 inches with a resultant inability of the site to support fescue. The forb-rich community now dominating this forested site contains alpine fleecflower, silky lupine, fringe leaf cinquefoil, creamy buckwheat, and prickly sandwort. A mid seral composition of lodgepole pine and subalpine fir comprise the tree layers. The community is located on quartz diorites in the Elkhorn Mountains.

Subalpine Fir/Drummond's Rush
Abies lasiocarpa/Juncus drummondii
ABLA/JUDR (n = 1)

This community is dominated by Drummond's rush, Ross' sedge, and prickly sandwort. Subalpine fir was the only tree species associated and dominated all tree layers. This subalpine site at 7,600 ft elevation on Dixie Butte in the Blue Mountains has been severely overgrazed by domestic sheep historically with light to moderate use by cattle, elk, and deer in recent times. Plants representative of the severe disturbance period are western needlegrass, alpine fleecflower, and low pussytoes. Drummond's rush is considered invasive as a result of overgrazing on a site once capable of supporting Idaho fescue.

Subalpine Fir/Slender Rush
Abies lasiocarpa/Juncus tenuis
ABLA/JUTE (n = 1)

A dry, cold lodgepole pine-dominated community succeeding to subalpine fir was found occurring on granodiorite in the Greenhorn Mountains. The granitic outcrop controlled the community with trees occupying fissures between rock outcrops and slender rush occupying the thin soils covering the site off the outcroppings. Other plants of note that were present at coverage of 5% or less were skunk-leaved polemonium, subalpine daisy, and mountain gooseberry.

Subalpine Fir/Western Needlegrass
Abies lasiocarpa/Stipa occidentalis
ABLA/STOC (n = 4)

These plant communities occupy gentle ridgetops where overgrazing by domestic sheep has resulted in a dominance by gravels and western needlegrass beneath tree overstories of subalpine fir with lodgepole pine. Sampled plots were from 6,800 to 7,700 ft in elevation in the Strawberry Mountains. These communities occurred on all aspects and on flat or convex surfaces. Substrates were basaltic, granitic, rhyolitic, and andesitic. Often occurring with needlegrass were elk sedge, Ross' sedge, meadowrue, and sweet cicely.

Grand Fir/Elk Sedge Plant Association
***Abies grandis/Carex geyeri* (ABGR/CAGE2)**



Minam River Canyon, Eagle Cap Wilderness, Wallowa Mountains Plot 6183

Distribution - The grand fir/elk sedge (ABGR/CAGE2) plant association is primarily represented at mid-montane elevations (4,600 to 6,800 ft) in the central and southern Blue Mountains. The sampled sites described in this study were representative of communities at high elevations of the southern Wallows.

Environmental features - Sampled sites were on granodiorite at 5,400 and 6,200 ft elevation. Slopes were moderate with southwest exposures at mid and lower slope positions. The surfaces were convex and flat.

Vegetation composition - These late seral stands were dominated by grand fir in all tree canopy layers. Douglas-fir also was associated as intermediate-sized trees in the overstory. Elk sedge dominated the undergrowth. Ross' sedge and Columbia brome were found at lower coverage levels. Few forbs occurred in the elk sedge-dominated sward. Three plants were common associates in the community, bigleaf sandwort, white hawkweed, and sidebells pyrola. Sampled grand fir averaged 150 years of age.

Successional relationships - Western larch is usually a pioneer with Douglas-fir following fire. Big huckleberry is unable to establish and persist on these sites. Elk sedge is too aggressive for other tolerant plants to gain a competitive advantage.

Disturbance ecology - With ungulate usage and overuse, bigleaf sandwort, Ross' sedge, and trail plant tend to increase.

Relationship to other studies - This plant association was first described by Johnson and Clausnitzer (1992) in the Blue Mountains. Hall (1973) included this vegetation in the mixed-conifer/pinegrass p.c.t. in the southern Blue Mountains. This is the first description for ABGR/CAGE2 in the Wallowa Mountains.

Table of Environmental Features
ABGR/CAGE2 (n = 2)

	MEAN		RANGE	
Elevation (ft)	5,825		5,430-6,220	
Slope (%)	18		15-20	
Aspect (no. of plots)	NW 0	NE 0	SE 0	SW 2
Geology	Granodiorite			
Position	Mid to lower slopes			
Relief	Convex, flat			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
grand fir	ABGR	40	100	20-60
Douglas-fir	PSME	3	100	3-3
Tree Understory				
grand fir	ABGR	22	100	16-28
Grasses				
Columbia brome	BRVU	2	100	1-3
Grasslikes				
elk sedge	CAGE2	35	100	20-50
Ross' sedge	CARO5	2	100	1-3
Forbs				
bigleaf sandwort	ARMA18	3	100	1-5
white hawkweed	HIAL	7	100	3-10
sidebells pyrola	PYSE	10	50	0-10

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	1	50	0-1
Rock	1	50	0-1
Gravel	0	0	0
Moss	1	50	0-1
Lichen	1	50	0-1
Litter	95	100	95-95

Grand Fir/Pinegrass Plant Association
***Abies grandis/Calamagrostis rubescens* (ABGR/CARU)**



Nebo Lookout Trail, Wallowa Mountains Plot 868

Distribution - This plant association is widely distributed in the central and southern Blue Mountains below 6,500 ft and occurs sporadically in the northern Blue and Wallowa Mountains below 7,000 ft. The highest elevation sites sampled for the type come from the Wallowa Mountains and were used for this portrayal.

Environmental features - Sampled sites occurred on granodiorite and basalt at all slope positions. The majority of the sites were on convex relief and southerly aspects. Slopes ranged from moderate to steep (mean = 36%).

Soils - The sole soil studied was formed in fairly thick volcanic ash over stony colluvium from weathered bedrock, with high available water capacity (about 8 inches). The profile consisted of silt loam to a depth of 17 inches, over very stony silt loam and sandy loam to a depth of more than 42 inches. (N = 1).

Vegetation composition - No late seral stands were observed. Mid seral stands were dominated by Douglas-fir with grand fir projected as the site's potential tree species with lack of fire. The undergrowth was codominated by pinegrass and heartleaf arnica. Birchleaf spiraea and creeping Oregon-grape were always present at low coverages. Other forbs usually associated were sweet cicely, bigleaf sandwort, white hawkweed, Piper's anemone, and woods strawberry.

Early seral stands were dominated by Douglas-fir with grand fir always present (25% to 30% or less coverage). Western larch and lodgepole pine were often components of the overstory and understory tree layers. Pinegrass dominated the undergrowth. Creeping Oregon-grape was often present along with bigleaf sandwort, woods strawberry, Piper's anemone, meadowrue, and white hawkweed.

Successional relationships - Sampled stands were relatively young (grand fir trees averaged 120 years; Douglas-fir trees averaged 145 years). Because there is a lack of big huckleberry in these stands at mid seral stages, it appears that these stands will not succeed to grand fir/big huckleberry plant associations. Grand fir/pinegrass sites are too dry and soils too well drained to permit shrub dominance.

Disturbance ecology - Repetitive and frequent underburnings have promoted pinegrass and retarded grand fir succession. Elk sedge tends to increase where surface disturbance has affected the pinegrass rhizomes and where the ash content of the soil is lost or lessened.

Relationship to other studies - Hall (1973) classified a similar plant community type (mixed conifer on ash soils) in the Blue Mountains. Steele et al. (1981) found ABGR/CARU as a minor habitat type on the lower elevation (5,200 to 6,100 ft) convex ridges south of the Seven Devils Mountains near McCall. Lillybridge et al. (1995) described a grand fir/pinegrass plant association on the Wenatchee National Forest that is similar. Johnson and Clausnitzer (1992) described grand fir/pinegrass as a plant association at low montane elevations (mean = 5400 ft) in the central and southern Blue Mountains. This describes ABGR/CARU as a plant association for the Wallowa Mountains for the first time.

Table of Environmental Features
ABGR/CARU (n = 4)

	MEAN		RANGE	
Elevation (ft)	6,193		5,780-6,690	
Slope (%)	36		20-50	
Stand age (years)	PSME	145	136-154	
	ABGR	121	90-160	
Aspect (no. of plots)	NW 1	NE 0	SE 1	SW 2
Geology	Granodiorite, basalt, metavolcanics			
Position	Upper, mid, lower slopes			
Relief	Convex, concave			

Table of Principal Species

SPECIES	CODE	Mid Seral		Early Seral	
		COVER (%)	CONSTANCY (%)	COVER (%)	CONSTANCY (%)
Tree Overstory					
grand fir	ABGR	15	100	7	100
Douglas-fir	PSME	60	50	20	100
western larch	LAOC	-	-	15	50
lodgepole pine	PICO	-	-	10	50
Tree Understory					
grand fir	ABGR	3	100	4	100
Douglas-fir	PSME	1	50	13	100
western larch	LAOC	-	-	5	50
lodgepole pine	PICO	-	-	10	50
Shrubs					
creeping Oregon-grape	BERE	2	100	20	50
birchleaf spiraea	SPBE2	3	100	1	50
Grasses					
pinegrass	CARU	23	100	40	100
Forbs					
heartleaf arnica	ARCO9	25	100	-	-
meadowrue	THOC	-	-	8	100
white hawkweed	HIAL	5	50	1	50
sweet cicely	OSCH	2	100	-	-
Piper's anemone	ANPI	10	50	10	50
woods strawberry	FRVE	15	50	10	50
bigleaf sandwort	ARMA18	1	100	1	50

Table of Ground Surface Features

	Mid Seral		Early Seral	
	COVER (%)	CONSTANCY (%)	COVER (%)	CONSTANCY (%)
Bareground	5	50	0	0
Rock	7	100	2	100
Gravel	1	50	1	50
Moss	8	100	5	50
Lichen	0	0	0	0
Litter	75	100	92	100

Grand Fir/Big Huckleberry Plant Association (n = 10)
***Abies grandis/Vaccinium membranaceum* (ABGR/VAME)**



Near Salt Creek Summit, Wallowa Mountains Plot 850

Distribution - This plant association is widely distributed at mid-montane to higher elevations in the Wallowa and Seven Devils Mountains. This description depicts the ABGR/VAME plant association at the uppermost elevations where grand fir/big huckleberry is adjacent to the subalpine zone.

Environmental features - All sampled sites were on basaltic substrates. The type occurs on all aspects, at all slope positions, and on all microrelief. Slopes were from gentle to moderate to steep. Elevations ranged from 5,700 to 6,500 ft (mean = 6,000 ft).

Soils - Soils consisted of a rather thick layer of volcanic ash over gravelly colluvium and residuum, with moderate to high available water capacity and pH of 6.0 to 6.6. Profiles consisted of silt loam (9 to 30 inches thick), over gravelly silt loam or silty clay loam. Bedrock was below the depth of observation, which was 45 inches or more. (N = 5).

Vegetation composition - In mid to late seral stands, grand fir dominated all layers of the tree overstory and understory. Douglas-fir was usually associated as an earlier seral dominant with grand fir in the overstory. Big huckleberry dominated the undergrowth. Prince's pine and Utah honeysuckle were other shrubs often associated. Herbaceous vegetation was dominated by light-intolerant plants (e.g., sidebells pyrola, round-leaved violet, rattlesnake plantain, bigleaf sandwort). Meadowrue, sweet cicely, and white hawkweed were forbs that occurred commonly. Tree ages averaged 150 years for sampled grand fir in mid to late stands.

Successional relationships - Early seral stages are represented by a dominance of lodgepole pine where stand-replacing fires have occurred; larch or lodgepole pine in mixed-severity burns; and by Douglas-fir where underburning and mixed-severity burns have occurred. Grouse huckleberry usually precedes big huckleberry following stand-replacement burns until the site has regained warmer, moister conditions and less exposure to frost. Lodgepole pine pioneers gentle to moderate slopes; western larch pioneers moderate to steep slopes. Birchleaf spiraea and creeping Oregon-grape are shrubs occurring under early seral trees in this plant association.

Disturbance ecology - Fires, avalanches, and browsing ungulates provide disturbances that affect these communities. Paired plots were installed in an avalanche chute and in the adjacent undisturbed mid seral ABGR/VAME stand in the Seven Devils Mountains. Following the avalanche, big huckleberry was eliminated; and light-intolerant plants were eliminated (sidebells pyrola, rattlesnake plantain). The avalanche chute was dominated by Rocky Mountain maple, chokecherry, birchleaf spiraea, and serviceberry. Elk and deer are frequent users of grand fir/big huckleberry communities. Grouse and bear relish huckleberries.

Relationship to other studies - The grand fir/big huckleberry plant association has been described by Hall (1973) in the Blue Mountains; Steele et al. (1981) and Cooper et al. (1991) in Idaho where *V. globulare* (tall huckleberry) is an ecological equivalent to *V. membranaceum* (big huckleberry). This plant association was previously described by Johnson and Simon (1986) in the Wallowa and Seven Devils Mountains, and by Johnson and Clausnitzer (1992) in the Blue Mountains.

Table of Environmental Features
ABGR/VAME (mid to late seral) (n = 6)

	MEAN	RANGE
Elevation (ft)	5,992	5,740-6,440
Slope (%)	29	10-60
Soil pH		6.0-6.6
Soil available water capacity (inches)		7-11.5 inches (moderate to high)
Thickness of volcanic ash mantle	19 inches	9-30 inches
Stand age (years)		
ABGR	153	110-275
PSME	140	109-180
PIEN	146	133-163
Aspect (no. of plots)	NW 2 NE 2 SE 1 SW 1	
Geology	Basalt (all)	
Position	Ridgetops and all slope positions	
Relief	Convex, concave, undulating	

Grand Fir/Big Huckleberry Plant Association (n = 10)
Table of Principal Species

SPECIES	CODE	Mid to Late Seral		Early Seral		Very Early Seral	
		COV	(n=6) CONS	COV	(n=3) CONS	COV	(n=1) CONS
Tree Overstory							
grand fir	ABGR	32	100	3	33	10	100
Douglas-fir	PSME	17	83	13	67	10	100
lodgepole pine	PICO	1	17	7	100	-	-
western larch	LAOC	1	17	7	67	-	-
Tree Understory							
grand fir	ABGR	11	100	23	100	1	100
subalpine fir	ABLA	1	50	1	67	-	-
Engelmann spruce	PIEN	1	50	3	33	-	-
Shrubs							
big huckleberry	VAME	40	100	70	100	-	-
Utah honeysuckle	LOUT2	1	50	1	67	3	100
birchleaf spiraea	SPBE2	1	33	6	67	30	100
Rocky Mountain maple	ACGL	1	17	-	-	45	100
chokecherry	AMAL2	-	-	-	-	10	100
creeping Oregon-grape	BERE	1	33	7	67	-	-
Forbs							
round-leaved violet	VIOR	8	100	1	67	-	-
sidebells pyrola	PYSE	5	100	4	67	-	-
rattlesnake plantain	GOOB2	5	83	1	67	-	-
white hawkweed	HAL	1	67	4	100	-	-
bigleaf sandwort	ARMA18	2	83	1	67	1	100
meadowrue	THOC	6	67	1	33	-	-

Table of Environmental Features

SPECIES	Mid to Late Seral		Early Seral		Very Early Seral	
	COV	(n=6) CONS	COV	(n=3) CONS	COV	(n=1) CONS
Soil Surface Cover						
Rock	4	60	7	67	65	100
Moss	16	80	14	67	1	100
Litter	83	100	75	100	20	100

Douglas-Fir/Pinemat Manzanita/Elk Sedge Plant Association
Pseudotsuga menziesii/*Arctostaphylos nevadensis*/*Carex geyeri* (PSME/ARNE/CAGE2)



Canyon Mountain, Strawberry Mountains Plot 8857

Distribution - This plant association is restricted to the ultramafic soils found in the Strawberry Mountains. Sites containing this vegetation were sampled in the subalpine fir zone. However, the dry-warm microenvironments created by the ultramafic rocks and southerly exposures eliminates subalpine fir as a potential species.

Environmental features - All sampled sites were on gabbro, peridotite or serpentine geologic formations. All plots were located on southerly exposures, steep slopes (mean = 52%) and convex to flat microrelief. Elevations ranged from 6,700 to 7,400 ft (mean = 7,113 ft).

Soils - The sole soil studied was formed in cobbly colluvium over bedrock, was shallow, and had low available water capacity (about 2.5 inches) and pH of 6.4. The profile consisted of very to extremely cobbly silt loam or sandy loam, with bedrock at 35 inches deep. (N = 1).

Vegetation composition - The late seral stands were dominated by Douglas-fir in overstory and understory layers. A rich shrub component dominated by pinemat manzanita included Oregon box myrtle, mountain snowberry, and mountain gooseberry. Herbaceous vegetation associated with the trees and shrubs was dominated by elk sedge with Wheeler's bluegrass and heartleaf arnica usually present. Tree ages averaged 220 years for Douglas-fir in the late seral sampled stands.

Successional relationships - No early seral vegetation was sampled. The pine of record was not ponderosa or lodgepole, but rather old-growth western white pine. Stands of western white pine are found in the headwaters of Indian Creek on the slopes of Baldy Mountain. It was unclear if white pine preceded the Douglas-fir or was incidental. Fire ignitions have probably underburned through the sedge mats. Fire has been sporadic owing to the discontinuous patches of forbs beneath the trees. Although saplings of subalpine fir were found on some of the sites, it is doubtful they will reach maturity because of drought or fire.

Disturbance ecology - Elk and deer made minimal use of this vegetation. Exceptions were with Oregon box myrtle. When it was present, it was severely hedged to 3 to 6 inches stature.

Relationship to other studies - This plant association has not previously been described.

Table of Environmental Features
 PSME/ARNE/CAGE2 (n = 4)

	MEAN		RANGE	
Elevation (ft)	7,113		6,750-7,380	
Slope (%)	52		50-55	
Stand age (years)	PSME	mean = 220	150-280	
	PIMO3	mean = 360	360	
Aspect (no. of plots)	NW 0	NE 0	SE 3	SW 1
Geology	Gabbro, peridotite, serpentine			
Position	Ridgetops; upper and middle slopes			
Relief	Convex to flat			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
Douglas-fir	PSME	40	100	11-85
Western white pine	PIMO3	1	25	0-3
Tree Understory				
Douglas-fir	PSME	18	100	11-25
subalpine fir	ABLA	2	50	0-6
Shrubs				
pinemat manzanita	ARNE	25	100	5-60
Oregon box myrtle	PAMY	3	75	0-10
mountain gooseberry	RIMO2	Tr	50	0-1
mountain snowberry	SYOR2	4	25	0-4
Grasses				
Wheeler's bluegrass	PONEW	2	100	1-5
bottlebrush squirreltail	SIHY	Tr	50	0-1
Grasslikes				
elk sedge	CAGE2	25	100	10-40
Forbs				
heartleaf arnica	ARCO9	7	75	0-25
western hawkweed	HIAL2	2	50	0-5
woolly groundsel	SECA2	1	50	0-3

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	1	75	0-1
Rock	19	100	10-40
Gravel	8	75	0-15
Moss	0	0	0
Lichen	0	0	0
Litter	54	100	35-70

Douglas-Fir/Pinegrass Plant Association
Pseudotsuga menziesii/Calamagrostis rubescens
(PSME/CARU)



Tenderfoot Road, near Johnson Creek, Wallowa Mountains Plot 891

Distribution - This association is found throughout the inland Pacific Northwest. It is common in the Blue and Wallowa Mountains of northeastern Oregon and southwestern Washington. The sampled sites described below represent the subalpine characteristics of this plant association for plots above 6,400 ft elevation in the Wallowa Mountains.

Environmental features - Sampled plots ranged from 6,400 to 6,500 ft in elevation. Slopes were moderately steep to steep with all sites facing the southwest. The microrelief was convex with sites occurring at mid to upper slopes. Substrates varied widely - basalts, granidiorite, and on limestone.

Soils - The sole soil studied was formed in gravelly colluvium over bedrock, was shallow, had low available water capacity (about 2.5 inches), and pH of 6.4. The profile consisted of very gravelly loamy to a depth of 16 inches, over weathered bedrock grading to hard bedrock at 30 inches deep.

Vegetation composition - Douglas-fir dominated tree overstory and understory layers in late seral stands. Herbaceous vegetation was highly dominated by pinegrass (mean = 73%). Other herbaceous vegetation highly associated were elk sedge, meadowrue, showy aster, and western hawkweed. One shrub species, creeping Oregon-grape, was always present in these subalpine PSME/CARU communities.

Successional relationships - Earlier seral vegetation was not sampled in this association at subalpine elevations. These sites historically underburned, whereas adjacent subalpine fir sites were replacement burned. Here lodgepole would dominate and provide some occasional migration into the droughtier Douglas-fir sites.

Disturbance ecology - These sites are convexities with good soil stability from the dense pinegrass mat. Ungulate pressure is minor. Elk and deer use is light.

Relationship to other studies - This is a common plant association with a broad ecological amplitude in the inland Pacific Northwest. It was described by Daubenmire and Daubenmire (1968), Hall (1973), Pfister et al. (1977), Steele et al. (1981), Cooper et al. (1987), Williams and Lilybridge (1983), Williams et al. (1991), Johnson and Simon (1987), and Johnson and Clausnitzer (1992).

Table of Environmental Features
PSME/CARU (n = 3)

	MEAN		RANGE	
Elevation (ft)	6,457		6,400-6,500	
Slope (%)	37		30-45	
Stand age (years)	mean = 237		140-310	
Aspect (no. of plots)	NW 0	NE 0	SE 0	SW 3
Geology	Basalt, granidiorite, limestone			
Position	Upper to middle slopes			
Relief	Convex			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
Douglas-fir	PSME	40	100	25-70
ponderosa pine	PIPO	1	33	0-3
Tree Understory				
Douglas-fir	PSME	10	100	5-15
lodgepole pine	PICO	2	33	0-5
Shrubs				
creeping Oregon-grape	BERE	6	100	1-15
Grasses				
pinegrass	CARU	73	100	55-95
Grasslikes				
elk sedge	CAGE2	1	67	0-1
Forbs				
western meadowrue	THOC	2	67	0-5
showy aster	ASCO11	1	67	0-1
western hawkweed	HIAL2	1	67	0-1
Canada milkvetch	ASCA11	7	33	0-20
heartleaf arnica	ARCO9	2	33	0-5

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	1	67	0-1
Rock	9	100	3-15
Gravel	1	33	0-1
Moss	1	67	0-1
Lichen	1	33	0-1
Litter	85	100	80-95

DOUGLAS-FIR COMMUNITIES

The following plant communities were observed and documented as potential vegetation. Sampled plots were too few to portray the probable variation or extent of these communities in the subalpine.

Douglas-Fir/Rocky Mountain Maple - Mountain Snowberry (N = 1) ***Pseudotsuga menziesii/Acer glabrum-Symphoricarpos oreophilus* (PSME/ACGL-SYOR2)**

This is a 6,500-ft elevation, topo-edaphic, plant community within subalpine fir potential forests in the Seven Devils Mountains of Idaho. Douglas-fir occurs on metabasalts and quartz diorite (granitics) as the only tree species capable of sustaining the harsh dry, warm microenvironment. Slopes were steep (70%) with deep colluvium beneath the plants. The sole soil studied was formed in gravelly colluvium and had a moderately low available water capacity (4 to 4.5 inches). The profile consisted of very to extremely gravelly silt loam and loam throughout the depth of observation (52 inches). Rocky Mountain maple, mountain snowberry, spiraea, and creeping Oregon-grape are principal shrubs. Herbaceous plants associated are those capable of persisting on shifting talus and colluvium (e.g., cleavers, bigleaf sandwort, heartleaf arnica, and sidebells pyrola). Rocky Mountain butterweed (*Senecio streptanthifolius*) was notable as an indicator of subalpine Douglas-fir communities in the Seven Devils Mountains. Ages of the trees ranged from 235 to 325 years (mean = 279 years).

Douglas-Fir/Mountain Snowberry/Elk Sedge (N = 2) ***Pseudotsuga menziesii/Symphoricarpos oreophilus/Carex geyeri* (PSME/SYOR2/CAGE2)**

This was a plant community found at 6,800 ft on the northeast exposure of Fields Peak in the Aldrich Mountains. Here the Douglas-fir trees are short statured (60 to 70 ft tall; 105 years old) growing on hydrothermally altered tonalite. Adjacent communities were fellfields and bittercherry or mountain-mahogany-dominated shrublands. Principal shrubs on the sampled sites were mountain snowberry and creeping Oregon-grape. Herbaceous vegetation was dominated by elk sedge, stickseed, horsemint, and blunt-fruited sweet cicely (*Osmorhiza depauperata*). This community had seen use by domestic sheep, big horn sheep, cattle, elk, deer, and pocket gophers. Reflecting this disturbance were the high coverages by stickseed, horsemint, cleavers, and miner's lettuce.

Douglas-Fir/Mountain Gooseberry/Skunk-Leaved Polemonium (n = 1) ***Pseudotsuga menziesii/Ribes montigenum/Polemonium pulcherrimum* (PSME/RIMO2/POPU3)**

This was another plant community found at 6,800 ft on northerly exposures in the Aldrich Mountains. Douglas-fir trees were only 65 to 75 ft tall and 138 years old. Mountain gooseberry and grouse huckleberry were the only shrubs in a forb-rich herbaceous understory. Dominant forbs were heartleaf arnica, skunk-leaved polemonium, Sitka valerian, fragrant bedstraw, and meadowrue. Elk use was prevalent.

Douglas-Fir-Ponderosa Pine-Western Juniper/Idaho Fescue (n = 1) ***Pseudotsuga menziesii-Pinus ponderosa-Juniperus occidentalis/Festuca idahoensis* (PSME-PIPO-JUOC/FEID)**

This represents the ultramafic (serpentine) forest plant community found extensively on the north slope of the Strawberry Mountains. Ponderosa pine, Douglas-fir, and western juniper are spatially arranged on these depauperate sites. As a result of the high metal content found in the serpentized soils, tree stature was stunted. Douglas-fir and western juniper both exhibited high dwarf mistletoe infection. It appeared as if the serpentine was poisoning the vegetation, resulting in a loss of tree vigor.

The understory vegetation was depauperate. No shrubs were associated. Gravels and rock dominated the ground surface. The herbaceous component was codominated by Idaho fescue and bluebunch wheatgrass. Other plants of note were elk sedge, linanthastrum, cymopterus, butterweed, and stonecrop. Two mustards - Nuttall's draba (*Draba densifolia*) and spreading pod rockcress (*Arabis divaricarpa*) - were notable features of the community.

Rocky Mountain Juniper-Curleaf Mountain-Mahogany (n = 1)
Juniperus scopulorum-Cercocarpus ledifolius (JUSC2-CELE3)

Rocky Mountain juniper (*J. scopulorum*) was found as a disjunct species from its Northern Rocky Mountain distribution in Montana and Idaho in the Wallowa River Canyon and some of its tributaries. The juniper does not perform well in subalpine environments in the northern Wallowa Mountains. It does reach higher montane elevations following limestone formations of the later Triassic Martin Bridge Formation. It was found at 5,900 ft elevation in Hurricane Creek Canyon of the Wallowa Mountains. Shrubs associated with the juniper are curleaf mountain-mahogany, mallow ninebark, creeping Oregon-grape, and common snowberry. Western juniper was not found on Rocky Mountain juniper sites. Adjacent forest is often dominated by Douglas-fir. This community was included in the study to document its occurrence in the northern Wallowa Mountains.

Quaking Aspen/Elk Sedge

Populus tremuloides-Carex geyeri (POTR5-CAGE2)

Aspen occur in the higher montane of the Seven Devils Mountains with communities sampled from 6,600 to 7,060 ft in elevation. These were located on steep (40%) upper slope sites facing the southwest. Quaking aspen was associated with mountain snowberry (rank at 4 to 5 ft tall) and serviceberry over a dominating sward of elk sedge (mean = 27%). Mountain brome and pinegrass also occurred. The forbs were lush and abundant. Blue stickseed, scarlet paintbrush, and woods strawberry were always present. Asters (thick stemmed; leafy), Sitka valerian, showy fleabane, and sweet cicely were often present.

Table of Environmental Features
POTR5/CAGE2 (n = 2)

	MEAN		RANGE	
Elevation (ft)	6,830		6,600-7,060	
Slope (%)	40		40-40	
Aspect (no. of plots)	NW 0	NE 0	SE 0	SW 2
Geology	-			
Position	Upper 1/3 slopes			
Relief	Convex, flat			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Tree Overstory				
quaking aspen	POTR5	48	100	35-60
Tree Understory				
quaking aspen	POTR5	20	100	10-30
Shrubs				
mountain snowberry	SYOR2	3	50	0-5
serviceberry	AMAL2	2	50	0-3
Grasses				
mountain brome	BRCA5	5	50	0-10
pinegrass	CARU	4	100	3-5
Sedges				
elk sedge	CAGE2	27	100	5-50
Forbs				
blue stickseed	HAJE	9	100	3-15
scarlet paintbrush	CAMI12	13	100	1-25
leafy aster	ASFO	10	50	0-20
thick-stemmed aster	ASIN3	2	50	0-3
woods strawberry	FRVE	13	100	5-20
Sitka valerian	VASI	3	50	0-5
showy fleabane	ERSPM	20	50	0-40
sweet cicely	OSCH	1	100	1-1
western coneflower	RUOC2	3	50	0-5
globe penstemon	PEGL5	3	50	0-5
sticky cinquefoil	POGL9	5	50	0-10

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	8	50	0-15
Rock	1	50	0-1
Gravel	0	0	0
Moss	0	0	0
Lichen	0	0	0
Litter	88	100	80-95

AVALANCHE COMMUNITIES



Near Razz Lake, Eagle Cap Wilderness, Wallowa Mountains Plot 6010

Avalanches are a frequent occurrence across many steep slopes of the subalpine where vertical distance from cornice to canyon bottom is great. Many forested slopes contain even-aged trees owing to stand initiation from a forest-regenerating event caused by avalanches. Several sites were sampled that had received stand-removing snowslides as recent events. A characterization of seres pertaining to forest plant associations follows:

Subalpine Fir-Whitebark Pine/Grouse Huckleberry-Pink Mountain Heath

***Abies lasiocarpa*-*Pinus albicaulis*/*Vaccinium scoparium*-*Phyllodoce empetriformis* (ABLA-PIAL/VASC-PHEM) (n = 1)**

This avalanche community occurred on granodiorites at a subalpine fir - whitebark pine/grouse huckleberry plant association site. It was characterized by the cold-tolerant pink mountain heath-dominating grouse huckleberry in a 3:1 ratio on hummocky microtopography. Between the hummocks, Parry's rush and woolly pussytoes dominated on shallow soils. Bistort occurred across the entire grassland area on hummocks and in the depressions. The site was at 8,000 ft elevation on a moderate (22%) northeast slope.

Subalpine Fir-Whitebark Pine/Grouse Huckleberry/Green Fescue ***Abies lasiocarpa*-*Pinus albicaulis*/*Vaccinium scoparium*/*Festuca viridula* (ABLA-PIAL/VASC/FEVI) (n = 1)**

This site was dominated by three plants - grouse huckleberry with green fescue on the hummocks and Parry's rush occupying the concavities of

the deflation depressions. The depressions were currently stable with mosses and erosion pavement covering the soil surface. The site was at 7,700 ft elevation on a moderate (40%) northwesterly slope. Granitic sands and gravels gave a coarseness to the substrate. This plant community was not assigned to a plant association.

Subalpine Fir/Grouse Huckleberry-Pink Mountain Heath ***Abies lasiocarpa*/*Vaccinium scoparium*-*Phyllodoce empetriformis* (ABLA/VASC-PHEM) (n = 2)**

These communities were found in the Wallowa Mountains at elevations between 8,000 and 8,500 ft. Slopes were 60 to 65%. Aspects were northeasterly. Ages of the avalanches were 50 to 100 years before present. The mountain heath was occupying the brows of terracettes. The only other shrub was grouse huckleberry. Parry's rush, woolly pussytoes, prickly sandwort, mountain pasqueflower, and green fescue were the prominent herbaceous plants. The adjacent stable forest vegetation pertained to the subalpine fir - whitebark pine/grouse huckleberry plant association.

Subalpine Fir/Green Fescue ***Abies lasiocarpa*/*Festuca viridula* (ABLA/FEVI) (n = 1)**

This community occurred in the Wallowa Mountains at 7,500 ft elevation on moderate slopes (30%) at southerly aspects. Avalanche age was 35 years before present. Whitebark pine and subalpine fir poles and saplings occupied a site dominated by herbaceous vegetation. Green fescue, prickly sandwort, cushion phlox, houndstongue hawkweed, Parry's rush, and golden buckwheat were the prominent herbs on the site. The adjacent forest, undisturbed by the avalanche event, pertained to the subalpine fir - whitebark pine/green fescue plant association.

Subalpine Fir/Parry's Rush ***Abies lasiocarpa*/*Juncus parryi* (ABLA/JUPA) (n = 1)**

This community occurred in the Wallowa Mountains on moderately steep slopes (55%) at 8,200 ft elevation. The site was southerly on granitic sands. The soil profile consisted of gravelly sandy loam to a depth of 4 inches, over very gravelly sand to a depth of at least 44 inches. Available water capacity was very low (1.5 to 2 inches). The site was harsh with drought in late summer and, owing to the southerly exposure, warmer than average temperatures for this high elevation. As a result, Parry's rush occupied microsite concavities where there was a higher moisture retention. In contrast, linanthastrum was predominant on the drier convex microsites. The adjacent forest, undisturbed by the avalanche event, pertained to the subalpine fir - whitebark pine/Parry's rush plant association.

TALUS COMMUNITIES



Slide Lake Basin, Strawberry Mountains Plot 8849

Talus and scree provide sites for opportunistic plants to pioneer in the shifting rubble. The more mobile talus is either unvegetated or may be occupied by deep toprooted plants capable of capturing water and nutrients deep in the rocks and gravel. The more sedentary talus can have all life forms represented from mosses and lichens to trees. The following is a characterization of the talus communities found in the subalpine of the study area:

Bracken Fern-Hood's Sedge

***Pteridium aquilinum-Carex hoodii* (PTAQ-CAHO5) (n = 1)**

This site was documented to represent the talus of Eagle Creek Canyon in the Wallowa Mountains. It was a varied community dominated by bracken fern, Hood's sedge, creeping Oregon-grape, alpine fleecflower, and elk sedge. The talus was considered stable with plants bedded between rocks and the sedges forming mat-like clusters that provided a stabilizing function. The talus was granitic. The site was a moderate slope (45%) facing the southwest at 6,200 ft elevation near the canyon bottom. The soil was formed in colluvium, with extremely bouldery sandy loam and loamy sand to at least 61 inches depth. Available water capacity was very low (about 1.5 inches) and pH 6.5 to 6.8.

Mountain Balm

***Monardella odoratissima* (MOOD) (n = 2)**

These sharp-scented mint plants occupy moderate to steep slopes (40 to 60%) in the subalpine talus. It occurs on all geologic substrates. Mountain balm is opportunistic to disturbances brought by the raveling slope. Commonly found in these communities are buckwheats (creamy and golden), western mugwort, varileaf phacelia, and eriophyllum. Rock and gravel surface cover is high (35 to 70%). The sites sampled were at the 7,000 ft elevational range in the Wallowa Mountains.

Linanthastrum-Cymopterus

***Linanthastrum nuttallii-Cymopterus terebinthinus* (LINU4-CYTEF) (n = 1)**

These two plants are commonly found on gravelly scree and talus slopes. They both withstand the shifting of surface rock and use their deep tap roots to anchor in cool, moist substrates deep below the surface. The site sampled was in the Wallowa Mountains on a gravelly basaltic slope (60%) with a southwesterly aspect at 7,700 ft elevation.

Linanthastrum-Mountain Mugwort

***Linanthastrum nuttallii-Artemisia ludoviciana* (LINU4-ARLU) (n = 2)**

These communities are commonly found on colluvial fans and talus near the bottom of the large canyons emanating from the center of the Wallowa Mountains. Sampled plots were at 7,000 to 7,200 ft on moderate to steep slopes. The sole soil studied was formed in unstable colluvium or residuum, with gravelly sandy loam to a depth of more than 31 inches. Available water capacity was moderate (about 5 inches). Hood's sedge was the only prominent graminoid. Other forbs prominently found with the linanthastrum and mugwort were blue stickseed, creamy buckwheat, alpine fleecflower, and sticky cinquefoil.

Linanthastrum-Longleaf Arnica

***Linanthastrum nuttallii-Arnica longifolia* (LINU4-ARLO6) (n=1)**

This describes the talus community found in cirque basins. Steep (80%), gravelly, shifting talus occurs at the base of cirque walls in the Strawberry Mountains where linanthastrum, longleaf arnica, sitka valerian, thick-leaved groundsel, and rose epilobium constituted the plants that could tenaciously persist on the shifting talus. The arnica was more prominent along the seepline located at the top of the talus and the base of the escarpment. Also tending to avoid the talus at the escarpment base were shrubby penstemon and eriophyllum. The site was 80% bedrock, rock, and gravel.

COLD AIR DRAINAGE COMMUNITIES



South Fork Imnaha River Canyon, Eagle Cap Wilderness, Wallowa Mountains
Plot 6037

The subalpine cirque basins and canyon bottoms often collect cold air, which can inhibit certain high-elevation plants from establishing. These settings give certain cold-tolerant plants a competitive advantage for site occupancy. The following are characterizations of key cold air drainage communities found in the subalpine of the study area:

Shrubby Cinquefoil

Potentilla fruticosa (POFR4) (n = 2)

These Wallowa Mountain sites were on gentle slopes (7% to 15%) at the lower elevations in the subalpine (5,600 to 6,700 ft) where rivers of cold air follow cold water stream bottoms. Shrubby cinquefoil dominated (10% to 25%). Plants associated with the cinquefoil were many and varied owing to the riverine settings. The principal herbaceous species were western needlegrass, elk sedge, linanthastrum, golden buckwheat, and penstemon.

Golden Buckwheat - Coiled Parrot's Beak

Eriogonum flavum - *Pedicularis contorta* (ERFL4-PECO6) (n = 1)

This Wallowa Mountain community was found on a moderate slope at 7,800 ft elevation on limestone glacial till of a cirque basin. The gravelly site was occupied by forbs capable of surviving short, cold growing seasons. Prominent occupants were golden buckwheat, coiled parrot's beak, Rocky Mountain butterweed, Oregon catchfly, and scabland fleabane. These sites offer little forage for ungulates. Mountain goats are the primary users.

ALPINE FLEECEFLOWER COMMUNITIES



Near Horse Heaven, Seven Devils Mountains Plot 7010

Alpine fleeceflower is an aggressive plant and is widespread in the Wallowa, Elkhorn, and Seven Devils Mountains. It is a steep slope occupant and withstands the movement of these slopes by anchoring large-branched roots deeply into the rocky colluvium. These communities were categorized as follows:

Alpine Fleeceflower-Green Fescue

Polygonum phytolaccaefolium-*Festuca viridula* (POPH-FEVI)
(n = 1)

This is an "accident slope" community where avalanches, slumping, and sliding are prevalent. Dominating with fleeceflower was tailcup lupine, creamy buckwheat, linanthastrum, and green fescue. The characteristics of this site are a steep slope (65%), southerly aspect, and high elevation (8,000 ft) on granitics in the Wallowa Mountains.

Alpine Fleeceflower-Pinegrass-Elk Sedge

Polygonum phytolaccaefolium-*Calamagrostis rubescens*-*Carex geyeri* (POPH-CARU-CAGE2) (n = 1)

This community was located in the southern Wallowa Mountains at 6,500 ft elevation on a basaltic, steep (65%), southerly slope. The pinegrass-elk sedge sod had out-competed fleeceflower over 30 years to reduce its dominance following overgrazing by domestic sheep. Prominent forbs associated were thick-stem aster, sticky cinquefoil, and western hawkweed.

Alpine Fleeceflower-Elk Sedge-Linanthastrum
Polygonum phytolaccaefolium-Carex geyeri-Linanthastrum
nuttallii
(POPH-CAGE2-LINU4) (n = 1)

This community also occupied steep slopes (65%) on a subalpine talus in the southern Wallowa Mountains. This vegetation was found on granitics. The community was codominated by fleeceflowers, linanthastrum, and elk sedge. Green fescue was relict on the sedentary portions of the talus. Other plants prominent in this community were western hawkweed, yarrow, and golden buckwheat. The site sampled was at 7,200 ft on a southerly slope. The soil was formed in colluvium and consisted of very to extremely stony and bouldery sand loam over bedrock at 55 inches. Available water capacity was low (about 2 inches) and pH 6.4 to 6.6.

Alpine Fleeceflower-Horsemint-Linanthastrum
Polygonum phytolaccaefolium-Agastache urticifolia-
Linanthastrum nuttallii (POPH-AGUR-LINU4) (n = 1)

This subalpine colluvial talus community was found on a steep slope (55%) comprised of granitic rock and gravels. Alpine fleeceflower and horsemint codominated with linanthastrum associated on convexities and bracken fern occupying moister concavities. These plants have stabilized the talus. Hood's sedge and needlegrasses were the principal graminoids present. The site sampled was at 7,000 ft on a southerly slope. The soil was formed in coarse-grained colluvium over granite bedrock, with very low available water capacity (1.5 inches) and pH of 5.5 to 6.0. The profile consisted of very to extremely gravelly and stony loamy sand and sandy loam over bedrock at 44 inches deep.

Alpine Fleeceflower Cornice Communities
Polygonum phytolaccaefolium (POPH)



Baldy Mountain Research Natural Area (proposed)

Alpine fleeceflower cornices represent the place of departure for the migration of fleeceflower into portions of the landscape where it would not persist were it not for the frequent disturbances afforded by avalanches, grazing animals, and mass slope movements. The buildup of deep snow and ice on the lee side of ridgetops provides a vernal source of moisture as snows melt and the cornice recedes. Alpine fleeceflower is well adapted to the short growing season, steep slope, and the raveling of the slopes following the recession of the snowbank. Eight communities were sampled and described in the Elkhorn and Seven Devils Mountains where they are frequently encountered and common.

Environmental features - Elevations ranged from 7,150 to 8,120 ft (mean = 7,736 ft). Slopes ranged from 35% to 65% (mean = 48%). Aspects were either northeasterly or southwesterly. All sites were in upper slope positions below the ridge crest. All microrelief was represented.

Geologic substrates - Seven Devils (granitic, andesitic). Elkhorns (granitic, argillitic).

Soils - Soils were formed in mixed loess, volcanic ash, and colluvium over bedrock, and had low to moderate available water capacity (4 to 6 inches) and pH of 6.0 to 6.3. Profiles consisted of gravelly silt loam 14 to 29 inches thick, over extremely gravelly or cobbly silt loam, over bedrock at 34 to 46 inches. (N=3).

Vegetation composition - Alpine fleecflower dominated all other plants (mean = 57%). Two grasses were frequently associated - western needlegrass and showy oniongrass. Lupines were often abundant. Other commonly occurring forbs were leafy aster, goosefoot violet, Douglas' knotweed, and wiry knotweed.

Surface features - These sites are not rocky (2%). They are gravelly (17%), with erosion pavement (7%) and bareground (12%) dominating for a total average cover of 36%. Mosses and lichens were virtually absent owing to the ongoing disturbance to the site. Litter averaged 20%.

Other findings - In the Seven Devils, American sawwort (*Saussurea americana*) was found as a significant member of the cornice community. Sheep overgrazing may have contributed to the disturbance regimes that have promoted fleecflower dominance. In the Elkhorns, pocket gopher activity may have provided the accelerated disturbance to enhance fleecflower. Ungulate overgrazing also provided for fleecflower migration in the Elkhorns. Deer and elk regularly nip the tops of the flowering, succulent fleecflower.

Table of Principal Species (n = 8)

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Grasses				
western needlegrass	STOC	8	63	0-35
showy oniongrass	MESP	3	63	0-10
Forbs				
alpine fleecflower	POPH	57	100	25-95
tailcup lupine	LUCA	11	50	0-50
goosefoot violet	VIPU4	1	50	0-1
leafy aster	ASFO	5	24	0-20
wiry knotweed	POMA9	1	24	0-5

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	12	100	5-40
Rock	2	24	0-10
Gravel	17	100	1-55
Pavement	7	50	0-20
Moss	1	24	0-1
Lichen	0	0	0
Litter	20	100	1-50

HOOD'S SEDGE COMMUNITIES

Hood's Sedge-Mountain Brome *Carex hoodii-Bromus carinatus* (CAH05-BRCA5)



Minam River Canyon, Eagle Cap Wilderness, Wallowa Mountains Plot 6182

Distribution - Wallowa and Seven Devils Mountains.

Environmental features - A commonly occurring plant community on avalanche sites at the lower subalpine elevations (mean = 6,700 ft) on moderate to steep slopes. It commonly occurs at lower slope and talus slope locations near canyon bottoms. Aspects are usually southerly. Microrelief is convex to undulating and often comprised of either granitic or basaltic rock.

Soils - The single soil studied was formed in loess over colluvium from sedimentary rocks. It had moderate available water capacity (4 inches). The profile consisted of gravelly silt loam to a depth of 9 inches, underlain by very gravelly silt loam to a depth of at least 30 inches. (N = 1).

Vegetation composition - These disturbed communities and sites are non-forested. Adjacent vegetation is often subalpine fir forest. Grasses (mountain brome and western needlegrass) and Hood's sedge dominate in this very early seral stage of succession. Forbs that often occur prominently in the community are horsemint, thick-stemmed aster, varileaf phacelia, sticky cinquefoil, blue stickseed, creamy buckwheat, and yarrow. Very recently disturbed sites are covered by annuals - cluster tarweed, Douglas' knotweed, and narrow-leaved collomia.

Successional relationships - The deep colluvial soils provide a good growing medium for deep-rooted plants. Lupines and penstemons are aggressive invaders and colonize these avalanche sites.

Disturbance ecology - These communities are very early seres following the avalanche event where soil, rock, and gravels are transported.

Relationship to other studies - This plant community has not been previously described.

Table of Environmental Features
CAHO5/BRCA5 (n = 7)

	MEAN		RANGE	
Elevation (ft)	6,680		6,300-6,970	
Slope (%)	29		20-50	
Aspect (no. of plots)	NW 0	NE 0	SE 2	SW 6
Geology	Granidiorite, basalt			
Position	Slopes (lower 1/3), canyon bottoms			
Relief	Convex, undulating			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Grasses				
mountain brome	BRCA5	11	100	1-25
western needlegrass	STOC	11	75	0-40
Sedges				
Hood's sedge	CAHO5	36	100	10-70
Forbs				
nettleleaf horsemint	AGUR	16	57	0-40
fleeceflower	POPH	2	29	0-15
common yarrow	ACMIL	5	71	0-30
creamy buckwheat	ERHE2	3	43	0-15
blue stickseed	HAJE	2	57	0-10
thick-stemmed aster	ASIN3	5	57	0-15
lupines	LUPIN	8	42	0-30
western mugwort	ARLU	3	29	0-20
sticky cinquefoil	POGL9	1	57	0-3
varileaf phacelia	PHHE2	1	57	0-1
Douglas' knotweed	PODO4	1	29	0-3
large-flowered agoseris	AGGR	1	29	0-3

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	9	100	1-30
Rock	19	86	0-50
Gravel	8	57	0-35
Moss	0	0	0
Lichen	0	0	0
Litter	16	100	1-40

Hood's Sedge-Elk Sedge

Carex hoodii-Carex geyeri (CAHO5-CAGE2) (n = 2)

These communities are lush, productive (1400 + pounds/acre), sedge dominated, and are found on basaltic ridges on the north and west flank of the Wallowa Mountains. Sampled sites were between 6,500 and 7,500 ft elevation. The single soil studied was formed in volcanic ash, loess, and colluvium over bedrock. The available water capacity was moderate (about 5.5 inches) and pH 6.2 to 6.8. The profile consisted of loam and gravelly loam to 16 inches deep, underlain by very cobbly sandy loam down to bedrock at 33 inches. These herbaceous communities occupied steep (55 to 60%), south-facing slopes with hummocky terracettes induced from freeze-thaw cycles and accentuated by animal traffic. Elk use was high. Domestic animals had also used these communities appreciably. In addition to the sedges, mountain brome and western needlegrass occurred abundantly. Mesic, deep-rooted forbs comprised the balance of the community. Associates were alpine fleecflower, blue stickseed, slender cinquefoil, sulfur penstemon, tailcup lupine, and rosy pussytoes.

Hood's Sedge-Sticky Cinquefoil

Carex hoodii-Potentilla glandulosa (CAHO5-POGL9) (n = 1)

This community was sampled on glacial till in the Seven Devils Mountains. Hood's sedge dominated the herbaceous vegetation. Other prominent forbs were sticky cinquefoil, creamy buckwheat, scarlet paintbrush, and tailcup lupine. Shrubs had established on the moraine as well. Creeping Oregon-grape, birchleaf spiraea, and mountain snowberry were key shrubs present in these communities.

FELDFIELDS



Chief Joseph Mountain, Eagle Cap Wilderness, Wallowa Mountains Plot 6145

Beyond the limits of tree growth, tundra occurs in alpine ecosystems at high latitudes. The alpine of the mountains in northeast Oregon and adjacent Idaho contain fellfields where "cushion" plant communities occupy sites dominated by rock, gravels, and erosion pavement. Fellfields are a type of alpine ecosystem characterized by rather flat relief, very stoney soil, and low, often widely spaced plants (Daubenmire 1978). These "stony sites" contain an average of 57% surface cover in rock, gravels, and pavement (range = 30% to 85%). The reason for this dominance by a "stony" surface is wind scour that removes any snows that blanket the ridges exposing the vegetation and finer particles to erosive forces. All fellfield sites sampled were at ridgetop or ridge brow locations. In the short spring-summer of the alpine country, these harsh sites are even more hostile to plant establishment owing to rapid drainage of melt water or rains, summer drought, and continued exposure to desiccating winds. The fellfield plants also are subjected to intense solar radiation at the high altitudes. The average elevation of fellfields sampled in the Wallowa Mountains was 9,200 ft. Slopes were gentle to moderate (mean = 23%; range 3% to 45%).

Plants occupying these ridgetops have to be adapted to withstand the strong winds, ice shearing, and desiccation by drought. Therefore, most plants are matted or cushioned, low in stature, and are either succulent, hairy, or heavily cutinized to conserve moisture. Good examples of "cushion plants" are phlox, buckwheats, sandworts, and pussytoes. The plant with highest frequency of occurrence across all sampled sites was ivesia. It has many small hairy leaflets whorled on the leaf axis above a branched caudex surmounting a taproot. It is capable of sustaining all the severe environmental elements in its alpine habitat.

Graminoids are more erect and require cushion plants to pioneer fellfields before they are capable of establishment. As more grasses and sedges occupy these sites, there is a greater buildup of soils, which will continue to promote graminoids leading to the demise of the cushion plants. Over a long period of progressive succession, the fellfield can be replaced by alpine turf (Zwinger and Willard 1972).

Fellfields were encountered mostly in the Wallowa Mountains. Only the ridges of the Greenhorn and Aldrich Mountains provided sample sites in the Blue Mountains.

Fellfield communities were only found at high subalpine elevations in the Wallowa Mountains. Elevations ranged from 8,700 ft to 9,500 ft (mean = 9,163 ft). The majority of the sites were on gentle to moderate slopes at ridgetop locations. Microrelief was convex to straight. The majority of the aspects were southerly. The underlying geologic rock units were predominately Columbia River basalts. However, fellfields also occurred on greenstones of the Clover Creek Formation and limestone of the Martin Bridge Formation (Walker 1979).

In fellfields, rock and gravel dominate the ground surface cover. For sampled plots, these surface features collectively averaged 49% (range = 30% to 65%). Cryptogams (mosses and lichens) collectively averaged only 3%.

Plants occurring on fellfield sites were "cushion plants" capable of sustaining the forces of desiccating winds and drought. No one plant species occurred on all sites. However, a group of plants were consistent members of fellfields in the Wallowa Mountains. The most prevalent plant was Gordon's ivesia (mean = 18% cover). Other common "cushion plants" that occurred on these sites were Cusick's crazyweed, alpine goldenrod, scabland fleabane, and lanceleaved stonecrop. Forbs with uncommon occurrence that occupied fellfields in the Wallowa Mountains were bupleurum, oval-leaved buckwheat, western bladderpod, and Wallowa penstemon. Of particular note were two "sensitive" paintbrushes endemic to the Wallowas that were found in some fellfield locations - *Castilleja fraterna* (fraternal paintbrush) and *C. rubida* (purple alpine paintbrush).

Sedges and grasses are minor components of fellfields. The paucity of soil development coupled with the desiccating winds impedes their establishment. However, grasses do occur in the protection of cushion plants. Over time, the grasses and sedges can outcompete the "nurse cushions" to occupy an alpine turf (Zwinger and Willard 1972). Green fescue, bottlebrush squirreltail, and Sandberg's bluegrass are low coverage occupants of some fellfield communities. Sedges were many. Dunhead sedge was the most common and occurred at a low coverage. One of the "sensitive" sedges in Oregon is an occupant of fellfields - *Carex nova* (new sedge).

Bare ground in sampled plots was attributed to pocket gophers rather than frost heaving. Primary users of fellfield vegetation are mountain goats. As disturbance was noted on some fellfields the plants appearing to increase were ivesia, yarrow, stonecrops, and phloxes.

**Table of Environmental Features
Fellfield Communities (n = 8)**

	MEAN		RANGE	
Elevation (ft)	9,163		8,740-9,500	
Slope (%)	23		3-45	
Aspect (no. of plots)	NW 1	NE 2	SE 1	SW 4
Geology	Basalt, greenstone, limestone			
Position	Ridgetops			
Relief	Convex			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Grasses				
green fescue	FEVI	3	26	0-20
Sandberg's bluegrass	POSA12	4	38	0-20
bottlebrush squirreltail	SIHY	1	38	0-1
Sedges				
Dunhead sedge	CAPH2	1	25	0-10
Forbs				
yarrow	ACMIL	1	25	0-1
bupleurum	BUAM2	1	25	0-3
fraternal paintbrush	CAFR	1	25	0-3
purple alpine paintbrush	CARU8	1	25	0-3
scabland fleabane	ERBL	2	38	0-10
dwarf yellow fleabane	ERCHB	3	25	0-25
cut-leaved daisy	ERCO6	1	25	0-1
oval-leaved buckwheat	EROV	1	25	0-5
Gordon's ivesia	IVGO	18	75	0-30
western bladderpod	LEOC	2	25	0-15
Cusick's crazyweed	OXCAC	5	50	0-10
Wallowa penstemon	PESP2	2	25	0-15
Hood's phlox	PHHO	4	25	0-20
lance-leaved stonecrop	SELA	1	38	0-1
woolly groundsel	SECA2	1	25	0-1
alpine goldenrod	SOMUS2	1	50	0-1

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	2	63	0-10
Rock	27	100	15-55
Gravel	22	100	10-40
Moss	2	63	0-5
Lichen	1	38	0-3
Litter	1	88	0-1

TURF COMMUNITIES



Hurwal Divide, Eagle Cap Wilderness, Wallowa Mountains Plot 6147

The alpine turf community is dominated by dwarf graminoids or by forb-dominated sites (Cooper et al. 1997). The change from fellfield to turf is gradual but perceptible with taller plants, less exposed rock, and more humus and soil development (Zwinger and Willard 1972). The turf communities, like fellfields, are still subjected to strong winds and wind scouring of the winter snow. They differ in the ability of the associated plants to provide a dense, more continuous cover of vegetation. Rock and gravel averaged 50% cover in fellfield sites and 33% in turf community sites.

Turf communities sampled were in the Wallowa Mountains in alpine settings ranging from 8,100 to 9,400 ft elevation (mean = 8,900 ft). Unlike fellfield sites, turf sites were found on mostly steep (10% to 60%; mean = 48%) upper to mid slopes above treeline. Aspects were westerly. Sampled sites were either on basaltic substrates or sedimentary rocks of the Hurwal Formation (especially limestone). A common feature of these steep slope sites are gravel stripes and hummocky microtopography from gravity slumps and slides.

Sedges and grasses were strong components with forbs on these sites. Frequently occurring grasses were bearded wheatgrass, spike trisetum, sheep fescue, and bluegrasses (*Poa alpina*, *P. incurva*, and *P. leibergii*). Two sedges were prominent - *Carex phaeocephala* (dunhead sedge) and *C. pyrenaica* (Pyrenaean sedge). Forbs found in fellfields were also common in these communities. Occurring with high frequency were fleabanes (*Erigeron chrysopsidis* var *brevifolia* - dwarf yellow fleabane;

E. compositus - cut-leaved daisy; *E. simplex* - alpine daisy); phloxes (*Phlox hoodii* - Hood's sedge; *P. pulvinata* - cushion phlox), and pussytoes (*Antennaria alpina* - alpine pussytoes; *A. umbrinella* - brown pussytoes).

Other forbs of higher stature that were not components of the fellfields but were prevalent in the turf community were *Lupinus lepidus* var. *lobbii* - prairie lupine; penstemons (*Penstemon procerus* - small-flowered penstemon; *P. spatulatus* - Wallowa penstemon); and cinquefoils (*Potentilla diversifolia* - mountain meadow cinquefoil; *P. glandulosa* - sticky cinquefoil; and *P. quinquefolia* - snow cinquefoil). Gordon's ivesia was as prominent in turf communities as it was in fellfield communities.

Table of Principal Species (n = 4)

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Grasses				
bearded wheatgrass	AGCA2	5	75	0-20
sheep fescue	FEOVB4	1	50	0-1
bluegrasses	POA	4	75	0-5
spike trisetum	TRSP2	1	50	0-3
Sedges				
sedges	CAREX	8	75	0-15
Forbs				
yarrow	ACMIL	2	75	0-5
pussytoes	ANTEN	1	75	0-1
fleabanes	ERIGE2	4	100	0-10
Gordon's ivesia	IVGO	14	50	0-45
prairie lupine	LULEL4	5	50	0-15
Cusick's crazyweed	OXCAC	2	50	0-5
penstemons	PENST	6	50	0-15
phloxes	PHLOX	18	75	0-30
cinquemoils	POTEN	1	75	0-1
lance-leaved stonecrop	SELA	1	50	0-3
alpine goldenrod	SOMUS2	2	50	0-5

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	2	100	1-3
Rock	12	100	1-25
Gravel	21	100	5-30
Moss	2	50	0-5
Lichen	1	25	0-1
Litter	5	75	0-15

SCREE COMMUNITIES



Middle Fork Divide (Imnaha River), Eagle Cap Wilderness, Wallowa Mountains Plot 6274

Scree communities were sampled in the Wallowa and Strawberry Mountains. Slopes were steep (40% to 60%; mean = 46%) with scree occurring on most slope positions (ridge crest to mid slope). Elevations ranged from 8,100 to 9,400 ft (mean = 8,916 ft). These communities were found on all aspects. The rocks of the scree came from varied geologic formations. Sampled sites occurred on igneous (diorite, dasite, basalt, and tuff) and sedimentary formations (siltstone).

The shifting of rocks and grounds by gravity, freeze-thaw, and animal movement prevents abundant plant colonization or establishment. Average cover by plant species was less than 5%. Often total plant cover was less than 40%. At the other extreme, rock and gravel constituted a 60% average for scree sites.

There were few plant species with frequent occurrence across the scree communities. The most frequently occurring forbs were sandworts (*Arenaria aculeata* - prickly sandwort; *A. nuttallii* - Nuttall's sandwort), drabas (*Draba densifolia* - alpine draba; *D. lonchocarpa* - twisted draba; *D. oligosperma* - few-seeded draba), crazy weeds (*Oxytropis campestris* - field crazyweed; *O. viscida* - sticky crazyweed), small flowered penstemon, cinquefoils (four different species), and lanceleaf stonecrop.

The fraternal paintbrush (*Castilleja fraterna*) was found in one scree community.

Table of Principal Species (n = 7)

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Grasses				
bluegrasses	POA	1	71	0-1
bottlebrush squirreltail	SIHY	1	57	0-3
needlegrasses	STIPA	1	29	0-3
spike trisetum	TRSP2	1	29	0-1
Forbs				
cliff anemone	ANMU	1	29	0-1
pussytoes	ANTEN	1	29	0-1
sandworts	ARENA	2	57	0-10
locoweeds	ASTRA	1	29	0-1
paintbrushes	CASTI2	2	29	0-10
drabas	DRABA	1	43	0-1
golden buckwheat	ERFL4	1	29	0-3
oval-leaved buckwheat	EROV	2	29	0-15
goldenweeds	HAPPL	2	29	0-15
Gordon's ivesia	IVGO	4	29	0-25
crazyweeds	OXYTR	1	43	0-5
small flowered penstemon	PEPR2	1	43	0-3
silverleaf phacelia	PHHA	1	29	0-1
phloxes	PHLOX	2	57	0-10
cinquefoils	POTEN	2	43	0-10
saxifrages	SAXIF	1	29	0-1
stonecrops	SEDUM	1	57	0-1
groundsels	SENEC	2	29	0-10
silenes	SILEN	1	29	0-1
alpine goldenrod	SOMUS2	1	29	0-3
mountain townsendia	TOMU	1	29	0-1

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	3	71	0-10
Rock	27	100	10-50
Gravel	33	100	3-75
Moss	5	43	0-20
Lichen	5	43	0-25
Litter	1	71	0-1

ERODED RIDGETOPS



Ridge near Bench Canyon, Eagle Cap Wilderness, Wallowa Mountains
Plot 6262

The heavy use of subalpine ridgetops, saddles, and upper slopes beneath the ridge crests by domestic livestock has resulted in plant communities that have an outward appearance of fellfields. Here, gravels cover the soil surface as erosion pavement or a continuous gravel layer. The solar radiation is high, desiccating winds frequent, and moisture availability is low owing to rapid drainage and lack of snow depth resulting from scouring by winds. Therefore, the plants associated on these sites are low, cushions or mats, hairy or succulent. There is a loss of graminoids from the severe overuse made by the sheep and cattle that frequented these ridges. Administratively, most of these eroded ridgetop communities were on "center stock driveways" where bands and herds were moved from one grazing ground to another in the late 1800s to early 1900s.

Two distinct kinds of eroded ridgetops were sampled at differing elevation ranges on different substrates in the Blue and Wallowa Mountains.

Phlox-Cymopterus communities (PHLOX-CYTEF) - These eroded ridgetop sites were found in the Greenhorn and Aldrich Mountains on volcanic sandstones, andesites, and serpentines. The surface cover dominating the area consisted of rock, gravel, bareground, and erosion pavement averaging 78%. Plant cover was scant. Cushion plants and xeric-site plants were prominent. Always present were phloxes (*P. pulvinata*, *P. hoodii*, *P. austromontana*) and turpentine cymopterus (averaging 4% cover each). Other forbs commonly found were yarrow, prickly sandwort, lupines, penstemons, and stonecrops. Grasses were low in cover with Sandberg's bluegrass, bottlebrush squirreltail, bluebunch wheatgrass, and Idaho fescue collectively averaging only 6%. All sites were on ridgetop locations between 6,800 to 7,600 ft elevation (mean = 7,100 ft).

Phlox-Ivesia communities (PHLOX-IVGO) - Eroded ridgetop sites were found in the Wallowa Mountains on Columbia River basalts. The surface cover dominating the area consisted of erosion pavement, gravel, and bareground averaging 82%. Plant cover, consisting of xeric-site and cushion plants, was low. Desert phlox, ivesia, and oval-leaved buckwheat were always present. Coverages usually averaged less than 10% for each. Other plants often found were stonecrop, penstemon, lupine, prickly sandwort, onions, and bottlebrush squirreltail. All sites were on ridgetop locations, gentle slopes, and above 8,000 ft elevation (mean = 8,200 ft). The two soils studied were shallow and droughty, formed in residuum from basalt over basalt bedrock. Profiles consisted of very to extremely gravelly sandy loam over bedrock at 6 to 12 inches deep. Available water capacity was very low (0.5 to 1 inch) and pH 6.5 to 7.0.

ROCK OUTCROP COMMUNITIES



Bullrun Rock, Blue Mountains Plot 8151

Rock gardens are found on knife edges, rims, and ridgetop outcrops. These occur in alpine and subalpine settings in the Blue, Wallowa, and Seven Devils Mountains. Rock, gravel, and bedrock averaged 84% on sampled sites. Forbs were the most common plants. Frequently occurring were prickly sandwort, cut-leaved and scabland fleabanes, golden and oval-leaved buckwheats, scarlet and ballhead gillias, silverleaf phacelia, and Payette and shrubby penstemons. Grasses were of low cover (less than 5%). The most prominent were bottlebrush squirreltail, Idaho fescue, and Sandberg's bluegrass.

GRUS COMMUNITIES



Ridge near Copper Creek Basin, Eagle Cap Wilderness, Wallowa Mountains Plot 6175

Formations of granidiorite exposed to intense weathering at alpine and subalpine elevations can crumble into particles called grus. These formations, dominated by grus, were found in the Copper Creek and Granite Gulch basins of the Wallowa Mountains at 8,500 ft elevation. A unique patterning of vegetation occurs on these "popcorn gravels." The severe drought and summer heat requires that plants be equipped to retain moisture and to acquire scant vernal moisture. Species capable of establishment and survival are prickly sandwort, ovalleaf buckwheat, and Gordon's ivesia. A plant found only on these formations was *Hulsea algida*. With its thick taproot, caudex, and densely glandular, woolly hairs seemingly covering all parts of the plant, it is well adapted for these sites.

SUBALPINE SHRUBLANDS

Mountain-Mahogany Communities

Mountain-mahogany (*Cercocarpus ledifolius*) has a wide ecological amplitude. The species can occur in rocky outcroppings along the Snake River's edge at less than 1,000 ft elevation to high montane subalpine elevations over 7,000 ft. Many communities are decadent with a singular age class represented owing to severe browsing of juvenile plants. Protection afforded by long-term exclosures demonstrates the ability of the shrubs to propagate a multi-aged stand in the absence of ungulates. Two mountain-mahogany plant community types were described for the subalpine in this study.

Curlleaf Mountain-Mahogany/Elk Sedge Community *Cercocarpus ledifolius/Carex geyeri* (CELE3/CAGE2) (n = 1)

These communities are found in the southern Blue Mountains at elevations generally higher (above 7,000 ft) than CELE3/FEID-AGSP communities. Mountain big sagebrush may be associated. Elk sedge is the predominant herbaceous associate. Sandwort, pussytoes, and buckwheats often are present.

Stands are heavily used by deer, elk, and bighorn sheep for browse, cover, and bedding. Fires restrict mountain-mahogany to rocky outcrops and gravelly slopes as the trees are easily killed by fire. Elk sedge is promoted with burning.

Mountain-Mahogany/Idaho Fescue-Bluebunch Wheatgrass Plant Association

Cercocarpus ledifolius/Festuca idahoensis-Agropyron spicatum (CELE3/FEID-AGSP)



Baldy Mountain Research Natural Area (proposed), Strawberry Mountains Plot 8868

Distribution - Wallowa, Strawberry, and Aldrich Mountains.

Environmental features - Sites occurred from 6,000 to 7,200 ft in elevation (mean = 6,673 ft) on peridotite, siltstone, and basaltic substrates. Slopes were moderate to steep (38% to 70%; mean = 54%). Sampled sites were on upper slope positions.

Vegetation composition - Mountain-mahogany dominated with crowns covering 30% to 40% of the sites. Mountain snowberry was a frequent associate. Idaho fescue and bluebunch wheatgrass were the prominent bunchgrasses. Elk sedge was often a component - especially in stands in the southern Blue Mountains. Occupying steep, rocky slopes associated with these subalpine communities were turpentine cymopterus and stonecrops. The rocky sites averaged as follows: bedrock - 8%; rock - 15%; and gravels - 32%.

Successional relationships - Sampled sites were mid seral as indicated by Idaho fescue and bluebunch wheatgrass in low cover and by high coverage of yarrow, creamy buckwheat, and golden buckwheat.

Disturbance ecology - Deer beds, droppings by deer and elk, and a defined browseline of lower canopy levels attest to the high use by deer and elk. These communities afford shade and bedding as well. Domestic sheep contributed to the degree to which these communities had been impacted through high historical use.

Relationship to other studies - Curlleaf mountain-mahogany vegetation has been previously described by Schlatterer (1972) in central Idaho, Muggler and Stewart (1980) in Montana, and Hironaka (1983) in Idaho. Hall (1973) described a mountain-mahogany/grass plant community type in the Blue Mountains. This broad type accepted pinegrass and elk sedge with Idaho fescue as associates. The CELE3/FEID-AGSP plant association was first described for the Blue and Ochoco Mountains by Johnson and Clausnitzer (1992). This description portrays the CELE3/FEID-AGSP community found at the upper montane elevations in northeast Oregon.

**Table of Environmental Features
CELE3/FEID-AGSP (n = 3)**

	MEAN		RANGE	
Elevation (ft)	6,673		5,900-7,180	
Slope (%)	54		38-70	
Aspect (no. of plots)	NW 1	NE 0	SE 0	SW 2
Geology	Basalt, peridotite, siltstone			
Position	Ridgetop and upper slopes			
Relief	Northerly			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Shrubs				
mountain-mahogany	CELE3	37	100	30-40
mountain snowberry	SYOR2	5	67	0-15
Grasses				
bluebunch wheatgrass	AGSP	15	100	10-25
Idaho fescue	FEID	2	67	0-3
Sandberg's bluegrass	POSE	2	67	0-5
Sedges				
elk sedge	CAGE2	1	67	0-3
Forbs				
yarrow	ACMIL	9	100	3-20
cymopterus	CYTEF	3	67	0-5
buckwheats	ERIOG	16	100	1-25
penstemons	PENST	5	100	1-10
stonecrops	SEDUM	4	100	1-10

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	4	100	1-10
Bedrock	8	100	5-15
Rock	15	100	5-20
Gravel	32	100	10-45
Moss	2	67	0-5
Lichen	1	33	0-1
Litter	27	100	5-55

MOUNTAIN BIG SAGEBRUSH COMMUNITIES



Vinegar Hill Research Natural Area (proposed), Greenhorn Mountains

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has a wide ecological amplitude in northeastern Oregon and adjacent Idaho. It is most common in Great Basin climatically influenced portions of the Blue, Wallowa, and Seven Devils Mountains. The species is only sporadically present as a shrubland in those portions of the mountains influenced by Columbia River climates (i.e., northern Blue and northern Wallowa Mountains). The species ranges from 4,500 to 8,000 ft in the Wallowa, Seven Devils, and Blue Mountains. The following described types portray the species and its communities in the subalpine above 6,500 ft in elevation.

There are three primary plant associations in the subalpine with mountain big sagebrush as the potential dominant. These are identified by using graminoids as subordinate vesicular identifiers. In the Wallowa Mountains, communities of ARTRV/FEVI occupy deep soils with high water-holding capacity, whereas ARTRV/FEID-AGSP communities occur on shallower soils with much lower water-holding capacities. Green fescue is deeper rooted and requires more moisture than Idaho fescue. In the Blue Mountains, ARTRV/CAGE2 occurs on deeper soils than ARTRV/FEID communities. ARTRV/FEVI does not occur in the Blue Mountains.

Mountain Big Sagebrush-Mountain Snowberry/Mountain Brome Plant Community Type

Artemisia tridentata vaseyana-Symphoricarpos oreophilus/Bromus carinatus (ARTRV-SYOR2/BRCA5)



Deep Creek Canyon, Seven Devils Mountains Plot 7068

Distribution - Southern Wallowa and Seven Devils Mountains.

Environmental features - This plant association occurs on basaltic and granitic substrates. Elevational range was 6,540 to 6,960 ft (mean = 6,820 ft). Slopes were moderate to steep (27% to 65%; mean = 42%). Sampled sites were all on southwesterly aspects. All surfaces were convex in relief. All sites sampled were at upper and mid slope settings. The single soil studied was formed in coarse-grained colluvium and residuum over bedrock, with very low available water capacity (1 inch) and pH of 6.4 to 6.8. The profile consisted of very to extremely cobbly loam and sandy loam, over bedrock at 13 inches.

Vegetation composition - Sagebrush dominated over, or codominated with, snowberry. The most common grass associated was mountain brome. All sampled vegetation exhibited the results of past disturbance. This was reflected in the forb composition and abundance by increaser species (i.e., lupines, penstemons, and buckwheats).

Successional relationships - Sampled sites either contained relict fescue or were devoid of any grass except mountain brome. It was determined the loss of fescues reflected past herbaceous loss from overgrazing. Forbs were abundant with apparent increases reflecting early seral stages. Increaser species were creamy buckwheat, sulfur penstemon, silky, and spurred lupines, sweetroot, and horsemint.

Disturbance ecology - Bareground coverages were high (mean = 13%). Cryptogams were absent. Pocket gopher activity tended to be moderate to high on early seral sites. These subalpine sites were used intensively by domestic sheep in the early 1900s.

Relationship to other studies - Habitat types of ARTRV-SYOR2 vegetation were described by Hironaka (1983). He classified three types with graminoid potential, bluebunch wheatgrass, Idaho fescue, and elk sedge, respectively. The ARTRV-SYOR2/BRCA5 plant community type described here was previously described for the Wallowa and Seven Devils Mountains (Johnson and Simon 1987).

Table of Environmental Features

ARTRV-SYOR2 (n = 3)

	MEAN		RANGE	
Elevation (ft)	6,820		6,540-6,960	
Slope (%)	42		27-65	
Aspect (no. of plots)	NW 0	NE 0	SE 0	SW 3
Geology	Basaltic, granitic			
Position	Ridgetop, upper 1/3 - mid 1/3 slopes			
Relief	Convex			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Shrubs				
mountain big sagebrush	ARTRV	32	100	11-70
mountain snowberry	SYOR2	8	100	1-15
Grasses				
mountain brome	BRCA5	5	67	0-15
Forbs				
horsemint	AGUR	5	67	0-10
creamy buckwheat	ERHE2	9	100	3-20
lupines	LUPIN	10	100	1-19
western sweetroot	OSOC	5	67	0-10
penstemons	PENST	10	100	1-25
sticky cinquefoil	POGL9	5	33	0-15

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	13	100	5-20
Rock	14	67	0-30
Gravel	14	100	1-40
Moss	0	0	0
Lichen	0	0	0
Litter	38	100	10-70

Mountain Big Sagebrush/Elk Sedge Plant Association
Artemisia tridentata var. *vaseyana*/*Carex geyeri* (ARTRV/CAGE2)



Elkhorn Crest overlooking Wind Creek Canyon, Elkhorn Mountains Plot 8513



Distribution - These communities were found in all the mountains of this study. It is a plant association that is common in the subalpine of the Blue Mountains (Strawberry, Greenhorn, Aldrich, and Elkhorn Mountains) and in the Seven Devils Mountains. It is weakly present in the Wallowa Mountains.

Environmental features - The subalpine sites sampled occurred from 6,370 to 8,200 ft in elevation (mean = 7,470 ft). Owing to the expansiveness of this type across varying geologic landforms, the substrates varied as well. Sampled sites occurred on igneous-granite, rhyolitic, andesitic; metamorphic - argillites, greenstone; and sedimentary geologies. Slopes varied from gentle to steep (4% to 75%; mean = 40%). Interestingly, southerly aspects dominated (SE = 32%, SW = 64%, and NW = 4%). The majority of sites were of convex microrelief.

Soils - Soils formed in colluvium over weathered bedrock, sometimes with a little loess mixed in near the surface. They have very low to low available water capacity (1 to 3 inches), and pH of 6.0 to 7.0. Profiles consisted of very to extremely gravelly and stony silt loam, sandy loam, and loam, over bedrock at 19 to 48 inches. Some profiles had a surface layer of gravelly or cobbly loam or sandy loam up to 9 inches thick. (N = 5).

Vegetation composition - Mountain big sagebrush dominates over an herbaceous layer where elk sedge is the dominant forb. Mountain snowberry was the only other shrub encountered (25% constancy). Elk sedge was clearly dominant. The only other graminoid found of consequence was western needlegrass (55% constancy) at a much lower coverage. Forbs were also present at lower coverages (less than 20%) except for sticky cinquefoil, alpine fleecflower and phloxes, which were occasionally at 20% to 30% cover. Litter was high reflecting lack of herbaceous forage use by ungulates (36% cover). Surface gravels were high (mean = 14%) reflecting soil loss and frost heaving. Also reflecting disturbance was a consistent bareground surface cover averaging 5%.

Successional relationships - In the Wallowa Mountains, ARTRV/CAGE2 was viewed as a disclimax community of ARTRV/FEID-AGSP (Johnson and Simon 1987). However, Idaho fescue is not a component of these communities, and except for some trace occurrences in the sampled population, it is now believed that ARTRV/CAGE2 constitutes a plant association. These sites are on deeper soils than the shallow soils of ARTRV/FEID-AGSP.

Late seral stands - Elk sedge mats cover nearly 50% of the site and are continuous beneath sagebrush plants and in the areas between sagebrush crowns. Phloxes (*P. pulvinata*; *P. austromontana*) and silenes (*S. oregana*; *S. douglasii*) are associated at lower coverages.

Mid seral stands - Disturbance to the elk sedge mats creates bare ground which is at first populated by annuals (i.e., Douglas' knotweed) or biennials (i.e., sheep sorrel, scarlet gilia). Next, pioneering perennials occupy these disturbance sites (i.e., needlegrasses) and other forbs associated in late seral stages exhibit increases (i.e., lupines).

Early seral stands - The most aggressive colonizer in subalpine deep soil sites is alpine fleecflower. It typically occupies the gravelly, bare ground. Other "weedy" forbs occupying early seral sites are horsemint, western sweetroot, and linanthastrum.

Disturbance ecology - Ungulates have influenced seral stage representation. Severely overgrazed sites decreases elk sedge cover and permits the increases by forbs. Domestic sheep and cattle along with elk and bighorn sheep utilize these communities. Terracettes attributed to early domestic sheep use are found near old bed grounds and on heavily used slopes of stock driveways. Pocket gophers are contributors to increased bare ground and increases by forbs. Fires stimulate elk sedge but retard mountain big sagebrush. Mountain big sagebrush sprout following light to moderate burns.

Relationship to other studies - First classified as a plant community type in the Seven Devils Mountains (Johnson and Simon 1987), plant association status was given to ARTRV/CAGE2 after classification work in the Blue Mountains (Johnson and Clausnitzer 1992). This description portrays that part of the ARTRV/CAGE2 plant association previously described for that portion pertaining to the subalpine zone.

**Table of Environmental Features
ARTRV-CAGE2 (n = 22)**

	MEAN	RANGE
Elevation (ft)	7,470	6,370-8,200
Slope (%)	40	4-75
Soil available water capacity (inches)		1-3 inches very low to low
Depth to bedrock (inches)	34	19-48
Soil pH		6.0-7.0
Herbage pounds/acre	912	850-1,035
Aspect (no. of plots)	NW 1 NE 0 SE 7 SW 14	
Geology	Granite, rhyolite, andesite, argillite, greenstone, and sedimentary	
Position	Ridgetop and upper slopes	
Relief	Convex	

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Shrubs				
mountain big sagebrush	ARTRV	27	100	3-60
mountain snowberry	SYOR2	1	27	0-1
Grasses				
bluebunch wheatgrass	AGSP	2	41	0-15
mountain brome	BRCA5	1	50	0-5
Idaho fescue	FEID	1	23	0-20
Wheeler's bluegrass	PONEW	1	27	0-5
Sandberg's bluegrass	POSE	1	9	0-1
needlegrasses	STIPA	2	55	0-20
Sedges				
elk sedge	CAGE2	36	100	10-70
Hood's sedge	CAHO5	1	18	0-7
Forbs				
yarrow	ACMIL	2	91	0-10
pussytoes	ANTEN	1	55	0-5
sandworts	ARENA	1	18	0-7
Indian paintbrushes	CASTI2	1	59	0-10
turpentine cymopterus	CYTEF	1	23	0-10
golden buckwheat	ERFL4	1	50	0-7
creamy buckwheat	ERHE2	2	55	0-10
eriophyllum	ERLA6	1	27	0-5
red avens	GETR	1	23	0-5
hawkweeds	HIERA	3	73	0-10
lupines	LUPIN	3	82	0-15
penstemons	PENST	1	45	0-10
phacelias	PHACE	1	14	0-2
phloxes	PHLOX	6	50	0-25
alpine fleecflower	POPH	2	32	0-20
sticky cinquefoil	POGL9	2	27	0-30

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	5	82	0-25
Rock	6	64	0-25
Gravel	14	100	1-35
Moss	0	0	0
Lichen	0	0	0
Litter	36	100	3-85

Mountain Big Sagebrush/Green Fescue Plant Community Type
Artemisia tridentata vaseyana/*Festuca viridula* (ARTRV/FEVI)



Tenderfoot Basin, Eagle Cap Wilderness, Wallowa Mountains Plot 6083



Distribution - Wallowa Mountains.

Environmental features - These communities were found on basaltic and argillitic substrates. Elevations ranged from 7,000 to 8,300 ft (mean = 7,720 ft). All sampled sites were on convex microrelief. Aspects were all southerly on ridgetops, upper and mid level slopes. Slopes were moderately steep (25% to 40%; mean = 32%).

Soils - The two soils studied were formed in loess and volcanic ash over colluvium, had moderate available water capacity (5 to 5.5 inches), and pH of 5.5 to 7.4. Profiles consisted of sandy loam, loam, silt loam, or gravelly sandy loam 17 to 35 inches thick, over very cobbly loam and sandy loam. One of the profiles had bedrock at 26 inches depth, whereas in the other, bedrock was below the depth of observation (less than 45 inches). (N = 2).

Vegetation composition - In this community, mountain big sagebrush was associated with green fescue. This is essentially the high-elevation plant association for the Wallowa Mountains where mountain big sagebrush occurs. In the Blue and Seven Devils Mountains, the fescue associated with mountain big sagebrush is Idaho fescue. Western needlegrass and bearded wheatgrass often are associated at low coverages. Forbs of prominence were buckwheats (golden and creamy), spurred lupine, and penstemons.

Successional relationships - Early seral stages in ARTRV/CAGE2 is characterized by decreased green fescue, increased forb cover (i.e., lupines, buckwheats, and penstemons), increased cover by needlegrass, and increased bare-ground cover.

Disturbance ecology - Ungulates have a high preference for green fescue and exert a high influence on composition and plant foliar cover. In disturbed communities, green fescue cover is diminished, forb cover is dominant, and sagebrush may be decreased as well. Bare ground is increased in early seral communities by ungulate overuse. Pocket gophers and marmots also provide increased bare ground and can affect plant composition.

Relationship to other studies - This is the first typification of mountain big sagebrush with green fescue as a potential plant association. Further investigation is needed for portraying a plant association with this type.

Table of Environmental Features
 ARTRV/FEVI (n = 3)

	MEAN		RANGE	
Elevation (ft)	7,720		7,000-8,300	
Slope (%)	32		25-40	
Aspect (no. of plots)	NW 0	NE 0	SE 1	SW 2
Geology	Basalt, argillite			
Position	Ridgetop; upper to mid slopes			
Relief	All			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Shrubs				
mountain big sagebrush	ARTRV	50	100	20-75
Grasses				
bearded wheatgrass	AGCA2	1	67	0-1
green fescue	FEVI	20	100	10-35
western needlegrass	STIPA	4	67	0-10
Sedges				
Hood's sedge	CAHO5	1	67	0-3
Forbs				
golden buckwheat	ERFL4	1	67	0-1
creamy buckwheat	ERHE2	7	100	1-15
lupines	LUPIN	8	67	0-15
penstemons	PENST	1	67	0-1

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	19	100	1-40
Rock	1	67	0-1
Gravel	1	33	0-1
Moss	2	33	0-5
Lichen	0	0	0
Litter	22	100	5-40

Mountain Big Sagebrush/Idaho Fescue-Bluebunch Wheatgrass Plant Association
Artemisia tridentata vaseyana/Festuca idahoensis
(ARTRV/FEID-AGSP)



Bullrun Rock, Blue Mountains Plot 8153



Distribution - This plant association is widely distributed in the Wallowa, Seven Devils, Strawberry, and Aldrich Mountains. It ranges from 4,500 to 8,000 ft in the Wallowa, Seven Devils, and Blue Mountains. This description is for that portion of the ARTRV/FEID-AGSP plant association occurring in the higher elevations of the subalpine.

Environmental features - Elevations ranged from 6,600 to 7,900 ft (mean = 7,500 ft). The type was found on basaltic and granitic substrates. Sites were primarily on upper moderate to steep slopes (15-50%; mean = 35%). All sites sampled were southerly (southwest predominated).

Soils - The two soils studied were shallow and droughty, formed in colluvium over basalt bedrock, probably with a small amount of loess mixed in at the surface. Available water capacity was very low (about 2 inches) and pH was 6.8. Profiles consisted of gravelly to extremely gravelly loamy soil over bedrock at 11 to 24 inches. (N = 2).

Vegetation composition - In late seral sampled stands mountain big sagebrush and Idaho fescue dominated over all other plants (ARTRV = 30%; FEID = 40-50%). Bluebunch wheatgrass may be associated but is subordinate to fescue at these higher subalpine elevations. Other grasses often present at lower coverages were mountain brome, bottlebrush squirreltail, and Sandberg's bluegrass. Forbs commonly occurring in ARTRV/FEID communities were yarrow, pussytoes, creamy buckwheat, lupines, and phacelia.

Successional relationships

Late seral stands - Mountain big sagebrush and Idaho fescue dominate. Forbs are subordinate with individual coverages less than 20%. Bareground cover is less (less than 5%). Mosses and lichens occur (usually less than 5% total cover).

Mid seral stands - Forbs increase with decline by bunchgrasses (e.g., FEID = 20%). Forbs that now assume greater dominance are yarrow, lupine, red avens, creamy and golden buckwheat, and green rabbitbrush. Bare ground has increased (greater than 10%). Mosses and lichens are at trace occurrence or not present.

Early seral stands - Bunchgrasses are low in cover (FEID = less than 10%). Forbs are now dominant beneath the sagebrush. Creamy buckwheat (a mat former) may occupy large expanses (up to 70%). Bare ground may be over 10% coverage.

Disturbance ecology - On highly disturbed sites, creamy buckwheat, golden buckwheat, yarrow, and mountain brome often occur with high coverages as opportunists following overgrazing. Domestic sheep and cattle have provided historical disturbances. Elk and deer heavily use these communities today. Severely browsed sagebrush was observed in the Strawberry and Aldrich Mountains sites.

Relationship to other studies - This plant association was previously classified in the Wallowa and Seven Devils Mountains (Johnson and Simon 1987). It also was classified for the Blue and Ochoco Mountains (Johnson and Clausnitzer 1992).

Table of Environmental Features
ARTRV/FEID-AGSP (n = 9)

	MEAN		RANGE	
Elevation (ft)	7,506		6,620-7,910	
Slope (%)	35		15-50	
Herbage (pounds/acre)	1,116		371-1,900	
Aspect (no. of plots)	NW 0	NE 0	SE 2	SW 7
Geology	Basalts, granitics			
Position	Ridgetop, upper slopes			
Relief	All			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Shrubs				
mountain big sagebrush	ARTRV	31	100	5-60
Grasses				
bluebunch wheatgrass	AGSP	10	67	0-25
mountain brome	BRCA5	2	56	0-15
Idaho fescue	FEID	17	100	5-45
Sandberg's bluegrass	POSE	2	44	0-10
bottlebrush squirreltail	SIHY	1	56	0-1
Forbs				
yarrow	ACMIL	6	89	0-10
pussytoes	ANTEN	2	67	0-10
Indian paintbrush	CASTI2	2	56	0-10
creamy buckwheat	ERHE2	14	89	0-70
lupines	LUPIN	8	89	0-15
phacelia	PHACE	1	67	0-5
groundsel	SEIN2	1	44	0-10

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	8	100	1-20
Rock	7	89	0-20
Gravel	8	89	0-25
Pavement	8	44	0-3
Moss	1	33	0-3
Lichen	1	22	0-1
Litter	32	100	1-80

MOUNTAIN BIG SAGEBRUSH PLANT COMMUNITY TYPES

The following three plant community types were determined to be reflective of severely disturbed sites. Further studies of alpine succession would be required to provide a potential (plant association) for these to be assigned. Intervention by managers would probably be required to reintroduce native decreaser species capable of growing to late seral stages.

Mountain Big Sagebrush/Mountain Brome Plant Community Type

Artemisia tridentata vaseyana/Bromus carinatus
(ARTRV/BRCA5) (n = 3)

These communities were sampled in the Greenhorn and Ochoco Mountains at elevations of 6,500 to 7,300 ft. These are very early and early seral communities where mountain brome, western needlegrass, blue stickseed, and tailcup lupine are prevalent. Pale agoseris is an aggressive invader in these communities and often covers large expanses where sheep and cattle overgrazing degraded these sites. Gophers now occupy these sites and continue active surface and subsurface disturbance. Bare ground surface cover averaged 22%. All sampled sites were on basaltic substrates. Gravels and erosion pavement combined for an average of 22%.

Mountain Big Sagebrush/Hood's Sedge Plant Community Type

Artemisia tridentata vaseyana/Carex hoodii (ARTRV/CAHO5)
(n = 2)

These communities were rich in herbaceous vegetation beneath the sagebrush. All vegetation sampled was in the Wallowa Mountains and represented sites where sheep overgrazing had resulted in the initial degradation. The single soil studied was formed in thin volcanic ash over colluvium, with moderate available water capacity (4.5 inches) and pH of 6.0 to 6.2. The profile consisted of gravelly silt loam 3 inches thick over very to extremely cobbly and gravelly silt loam and loam to at least 60 inches deep. Hood's sedge was the dominant herbaceous plant (mean = 30%). Always present were horsemint, sticky aster, and mountain brome. Other commonly occurring forbs were tailcup lupine, yarrow, and broad-petal strawberry. Bare ground was high (mean = 13%) with rock and gravels averaging 10%.

Mountain Big Sagebrush/Linanthastrum Plant Community Type

Artemisia tridentata vaseyana/Linanthastrum nuttallii
(ARTRV/LINU4) (n = 2)

Linanthastrum occupies subalpine slopes where sheep overgrazing has left terracettes and overuse has resulted in a forb-rich community. The two soils studied had moderate available water capacities (5.5 to 6.5 inches) but otherwise rather different properties. One consisted of a thick loess layer and strong A horizon (silt loam and sandy loam, 31 inches thick) over colluvium. The other was formed in gravelly colluvium and residuum (gravelly to very gravelly sandy loam). The only grasses occurring were western needlegrass and mountain brome at low coverages. Hood's sedge was always present (mean = 4%). Forbs were dominated by linanthastrum (mean = 20%). Other prominent forbs were yarrow, creamy buckwheat, and blue stickseed. Bare ground was high (mean = 13%) on rocky sites (mean = 15%).

MOUNTAIN BIG SAGEBRUSH COMMUNITIES

Mountain Big Sagebrush/Golden Buckwheat-Phlox Communities

Artemisia tridentata vaseyana/Eriogonum flavum-Phlox
(ARTRV/ERFL4-PHLOX) (n = 1)

These communities were found in the Elkhorn Mountains. The subalpine slopes had been subjected to sheep overgrazing, sheet erosion, and continuous wild ungulate use. Bareground, erosion pavement, and pea gravels dominated (50% cover) beneath the sagebrush plants. Two forbs were the most dominant with a combined cover of 25% (golden buckwheat and western mountain phlox). Invading on these sites was alpine fleecflower.

Table of Principal Species

SPECIES	CODE	ARTRV/ BRCA5		ARTRV/ LINU4		ARTRV/ CAHO5		ARTRV/ERFL4- PHLOX	
		COV	CON S	CO V	CON S	CO V	CON S	COV	CONS
SHRUBS									
mountain big sagebrush	ARTRV	45	100	23	100	45	100	20	100
mountain snowberry	SYOR2	3	67	3	50	1	50	-	-
GRASSES									
mountain brome	BRCA5	6	100	3	50	1	100	1	100
western needlegrass	STOC	5	100	1	100	1	50	-	-
SEDGES									
Hood's sedge	CAHO5	-	-	4	100	30	100	-	-
FORBS									
yarrow	ACMIL	1	67	3	100	3	50	1	100
nettleleaf horsemint	AGUR	-	-	1	50	5	100	-	-
pale agoseris	AGGLM	8	33	-	-	-	-	-	-
rigid fiddleneck	AMRE2	2	33	-	-	-	-	-	-
sticky aster	ASIN3	-	-	-	-	2	100	-	-
golden buckwheat	ERFL4	-	-	-	-	-	-	10	100
creamy buckwheat	ERHE2	-	-	6	100	8	50	-	-
eriophyllum	ERLA6	4	67	-	-	-	-	-	-
broad-petal strawberry	FRVI	-	-	8	50	8	50	-	-
blue stickseed	HAJE	14	100	3	100	-	-	-	-
western hawkweed	HIAL	1	67	5	50	2	50	-	-
linanthastrum	LINU4	-	-	20	100	-	-	-	-
tailcup lupine	LUCA	5	100	-	-	3	50	5	100
western mountain phlox	PHAU3	-	-	-	-	-	-	15	100
alpine fleecflower	POPH	-	-	-	-	-	-	5	100

Table of Ground Surface Features

SPECIES	ARTRV/ BRCA5		ARTRV/ LINU4		ARTRV/ CAHO5		ARTRV/ERFL4- PHLOX	
	COV	CONS	COV	CONS	COV	CONS	COV	CONS
Bareground	22	100	13	100	13	100	20	100
Rock	6	100	15	100	9	100	0	100
Gravel	22	100	0	100	1	50	30	100
Moss	0	100	0	100	0	100	0	100
Lichen	0	100	0	100	0	100	0	100
Litter	1	33	20	100	20	100	3	100

Low Sagebrush/Idaho Fescue-Bluebunch Wheatgrass Plant Association
Artemisia arbuscula/Festuca idahoensis-Agropyron spicatum
 (ARAR8/FEID-AGSP)



McClellan Mountain, Aldrich Mountains Plot 8874



Distribution - Communities of this plant association occur in the southern Blue and Ochoco Mountains from 4,300 to 6,900 ft elevation. This description covers the subalpine ARAR8/FEID-AGSP communities occurring in the Aldrich and Ochoco Mountains.

Environmental features - Elevations ranged from 6,650 to 7,220 ft elevation (mean = 6,868 ft). Sampled sites were on upper slopes on convex to flat microtopography. Slopes averaged 33% (range = 3% to 50%) and were predominantly southerly. These low sagebrush communities were found on basaltic and andesitic substrates. These are gravelly sites (mean = 13%) with bareground surface cover averaging 18%.

Soils - The two soils studied formed in volcanic ash and colluvium over bedrock, and had low available water capacity (2 to 2.5 inches) and pH of 6.4 to 6.5. Profiles consisted of gravelly sandy loam 4 to 10 inches thick, over extremely gravelly and cobbly sandy loam and sandy clay loam, with bedrock at 34 to 42 inches. (N = 2).

Vegetation composition - Low sagebrush was the only shrub present with a foliar cover average of 29%. The two principal bunchgrasses were present with approximately the same cover as the sagebrush. Sandberg's bluegrass was found on gentle or moderate slopes in these communities. Spurred lupine was the dominant forb. Other forbs of high presence were woolly goldenweed, yarrow, lance-leaved stonecrop, and turpentine cymopterus. Cryptogams were not found.

Successional relationships - Mountain big sagebrush and low sagebrush often cohabitat areas but are restricted to different microsites. Mountain big sagebrush generally requires deeper soils, whereas low sagebrush occupies shallower soils. Earlier seral stages are characterized by lower bunchgrass cover and increased forb cover (i.e., lupine, creamy buckwheat).

Disturbance ecology - Deer hedge the sagebrush; domestic livestock preferentially utilize the bunchgrass. Highly disturbed sites resulting from overgrazing contain abundant lupine, yarrow, and annual forbs. Creamy buckwheat and golden buckwheat form large mats in early seral communities. Badgers are providers of spot disturbance.

Relationship to Other Studies - Hall (1973) first described ARAR8/FEID-AGSP as a plant community type in the Blue and Ochoco Mountains. Mueggler and Stewart (1980) identified ARAR8/FEID and ARAR8/AGSP as habitat types in Montana. This plant association was previously described by Johnson and Clausnitzer (1992) for the Blue and Ochoco Mountains.

Table of Environmental Features
ARAR8/FEID-AGSP (n = 4)

	MEAN		RANGE	
Elevation (ft)	6,868		6,650-7,220	
Slope (%)	33		3-50	
Aspect (no. of plots)	NW 0	NE 1	SE 1	SW 2
Geology	Basalts, andesites			
Position	Upper slopes			
Relief	Convex, flat			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Shrubs				
low sagebrush	ARAR8	29	100	10-45
Grasses				
bluebunch wheatgrass	AGSP	9	100	1-15
Idaho fescue	FEID	18	100	15-25
Sandberg's bluegrass	POSE	4	50	0-10
Forbs				
yarrow	ACMIL	2	75	0-3
turpentine cymopterus	CYTEF	3	75	0-10
golden buckwheat	ERFL4	1	50	0-3
creamy buckwheat	ERHE2	6	50	0-20
woolly goldenweed	HALA3	1	100	1-3
spurred lupine	LULA3	9	100	1-15
phlox	PHLOX	5	50	0-15
lance-leaved stonecrop	SELA	1	75	0-1

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	18	100	1-60
Rock	2	50	0-5
Gravel	13	100	0-20
Moss		0	
Lichen		0	
Litter	28	75	0-80

Shrubby Cinquefoil/Idaho Fescue Community ***Potentilla fruticosa/Festuca idahoensis* (POFR4/FEID)**

Shrubby cinquefoil prefers saturated deep soils with cold temperatures. These communities exist on flat or convex surfaces of ridgetops on the north flank of the Wallowa Mountains. Sampled sites occurred on basaltic substrates from 7,300 to 7,600 ft (mean = 7,500 ft) on gentle slopes (mean = 20%). Dominating these communities was Idaho fescue (mean = 35%) with cinquefoil occurring on disturbed areas resulting from slumps or rodent upwellings. Occurring in a dense mat with fescue were sedges (e.g., elk or Liddon's). Lupine, twin arnica, red avens and Cusick's paintbrush were members of the fescue-sedge mat. Pussytoes yarrow and shrubby cinquefoil occupy lithic areas devoid of competition from the sod. Slumps tended to be populated by sedges with cinquefoil occurring on the slump faces. Cinquefoil is associated on the better drained convex microsites.

Mountain Snowberry Communities ***Symphoricarpos oreophilus* (SYOR2) (n=4)**

Mountain snowberry is found throughout the mountainous landscape of northeast Oregon. It often forms a transitional community between forest and nonforested sites on or near ridgetops in the Blue and Wallowa Mountains (Johnson and Simon 1987, Johnson and Clausnitzer 1992). Shrublands transitional to Douglas-fir and subalpine fir forests were sampled in the Seven Devils, Wallowa, and Aldrich Mountains between 5,600 and 6,900 ft elevation (mean = 6,393 ft). The shrubs occupied moderate to steep southerly slopes (30% to 70%; mean = 49%) on upper and mid slope positions. The two soils studied were droughty (low available water capacity, 2 to 2.5 inches) and had pH of 6.5 to 7.0. One was formed in thin loess over bedrock (fine sandy loam and gravelly loam over bedrock at 10 inches); the other was formed in thick colluvium and residuum (extremely gravelly silt loam) over bedrock at 42 inches depth.

In the Aldrich Mountains, mountain snowberry was associated as a dominant with chokecherry as a seepage community on steep slopes of volcanic sandstone talus. *Cymopterus* was a prolific (30%) associate. In the Seven Devils Mountains, mountain brome and sticky cinquefoil were strong associates. In the Wallowa Mountains, little sunflower and creamy buckwheat provided the prominent herbaceous component. Although bluebunch wheatgrass was present on half the sampled plots, mountain brome occurred on all plots (10% to 25%; mean = 22%).

Bitter Cherry Communities ***Prunus emarginata* (PREM) (n=1)**

Bitter cherry (*Prunus emarginata*) is found commonly throughout the southern Blue Mountains and Great Basin, but only sporadically northward. In the subalpine of the Wallowa Mountains, bitter cherry formed a dense shrubland on steep slope granodioritic soils. It dominated with strong representation by other mid-tall shrubs (mountain snowberry, mountain big sagebrush, Rocky Mountain maple, and serviceberry). These shrublands probably result from stand-replacement disturbances (fire, avalanche). A preference by browsing ungulates was demonstrated for serviceberry - often found severely hedged.

Common Juniper Communities ***Juniperus communis montana* (JUCO6) (n=2)**

Common juniper communities were sampled on subalpine mountain summits and ridges in the southern Blue Mountains (Greenhorn and Strawberry Mountains). The shrub also occupies narrow cornices and ridgetops in the Seven Devils, Wallowa, and Elkhorn Mountains.

Sampled communities were so dominated by juniper canopies (up to 70% cover) that associated herbaceous vegetation was usually at coverages of 5% or less for a given associate. In the Greenhorns, prostrate juniper averaged 20 inches in height. Key herbaceous plants associated were western mountain phlox and alumroot. In the Strawberry Mountains, the naturally protected summit of Slide Mountain provided an excellent benchmark plot for these communities. A steep, rocky boulder field surrounded this summit eliminating domestic livestock and larger native ungulates from access. The juniper was able to persist in cold, windy environmental conditions where whitebark pine and subalpine fir struggled to persist in Krummholz groves adjacent to the juniper. The principal herbaceous associates (at less than 5% each) were Parry's rush, prickly sandwort, and Ross' sedge.

GREEN FESCUE SERIES



Sugarloaf Mountain, Wallowa Mountains Plot 1209

Green fescue occurs in the Cascade Mountains of Oregon and Washington, the Rocky Mountains of Canada and northern Idaho, and is present in subalpine clearings and on montane slopes in the Wallowa Mountains.

Green fescue communities at high elevations in the Wallowa Mountains reflect a cold, moist climate where green fescue is more adapted than Idaho fescue. In late seral stands, green fescue forms dense mats with relatively few breaks in the continuous sod. If pristine stands were available, a basically forb-free grassland would be achievable.

Green fescue is the dominant plant of the highest elevation grassland communities in the Wallowa Mountains. Elevations range from 6,300 to 8,400 ft (mean = 7,500 ft). These communities occur on high-elevation basalt ridges fringing the Wallowa Granitic Uplift.

Soils are typically dark reddish brown in color in surface layers, greater than 32 inches deep, and formed in basalt colluvium, loess, and ash.

A late seral green fescue subalpine grassland would include a nearly forb-free continuous sod mat of this bunchgrass with interspaces consisting of litter in the virtual absence of bare ground, erosion pavement, or gravel and rock particles. Overgrazing results in the exposure of bare ground, which then is removed by accelerated surface wind and water erosion. Deteriorated green fescue communities are characterized by a distinctive hummocky appearance with deflation depressions containing an erosion pavement. Weedy forbs, needlegrasses, or Ross' sedge increase with disturbance. In depleted green fescue rangelands, where the continuous grass sod and surface soil has been broken, soil loss can be rapid. The melting of high-elevation snowfields, provides an abundant source of melt water capable of creating severe gully erosion on sodless slopes.

The secondary successional relationships of vegetation in green fescue communities is well documented in pioneering investigations conducted by Arthur W. Sampson (Sampson 1908, 1909) between 1907 and 1911 on the Standley Allotment in the Wallowa Mountains. Then in the 1940s, E.H. Reid and G.D. Pickford continued to produce fundamental standards to assess the direction of succession and to rate condition on these subalpine grasslands (Reid 1941, Pickford and Reid 1942, Reid and Pickford 1946). Reid continued his studies in Tenderfoot Basin through retirement and was able to show photographic evidence of vegetative change by using comparative camera points through a time sequence (Reid et al. 1980). Similar comparative photography was used to document change from Sampson's earlier photographic work at Standley (Strickler and Hall 1980, Reid et al. 1991). Rangeland monitoring sites utilizing Parker 3-Step C&T clusters established in the 1950s - 1970s also have proven valuable in assessment of successional dynamics. Recent monitoring of vegetation transects established by Strickler in 1956 and of the Standley-Sturgill and Tenderfoot Basin camera point sites established by Sampson and Reid give further information relative to plant succession in green fescue communities (Johnson 2003).

Green Fescue Plant Association
Festuca viridula (FEVI)



Nebo Lookout Ridge, Eagle Cap Wilderness, Wallowa Mountains Plot 6104



Distribution - Wallowa Mountains. Green fescue is not found in other mountains of the study area except for a few isolated stands in the northern Blue Mountains.

Environmental features - This plant association was found only on Columbia River basalts (Grande Ronde and Yakima Formations). Elevations ranged from 7,200 to 7,900 ft elevation (mean = 7,480 ft) in the Wallowa Mountains. A Blue Mountain site included in this type occurred at 5,600 ft elevation. Slopes were gentle to moderately steep (5% to 20%; mean = 12%). Sampled sites occurred on all aspects. Sites were generally on flats or upper slope positions on ridges and occurred in basins, on slopes, or flats. All microrelief locations were represented.

Soils - Soils are formed in a rather thick layer of volcanic ash or ash plus loess, over colluvium and bedrock. Available water capacity ranges from moderate to very high, and pH value can be somewhat acidic (5.5 to 6.4). Profiles consist of a surface layer of silt loam, loam, gravelly silt loam, or gravelly loam 12 to 44 inches thick, over very cobbly or very gravelly loamy soil. Bedrock begins at a depth of 26 to 70 inches. (N = 5).

Vegetation Composition - In this plant association, green fescue dominates over all other plant species and covers from 60% to 85% (mean = 68%) in late and mid seral communities. The only other grasses frequently occurring were needlegrasses. They were present at low coverages (1%) on most sites. Of the associated sedges, only Ross' sedge occurred frequently (43% of the time). Forbs were scarce and of low coverage as well. The most common forbs were yarrow and nodding microseris. Mosses were infrequently found. Lichens were not found.

Successional relationships - Late seral stands are differentiated from stands at mid or early seral stages by lower coverages of bare ground and erosion pavement. Erosion pavement and bare ground averaged 13% on late seral sites; 20% and greater on mid and early seral sites.

Disturbance ecology - Intensive use by domestic livestock (especially sheep) in the early 1900s created changes in plant composition with forbs and other grasses increasing in cover as green fescue was weakened. Continuous grazing, season after season, broke the fescue sod covering the deep soils. This enabled wind and water to erode surface soils creating deflation depressions and expanses devoid of vegetation. An erosion pavement consisting of gravel-sized particles would cover depressions over time. With cessation of the accelerated erosion, the interstitial areas would be colonized by needlegrasses, spraguea, pussytoes, and penstemons in this type.

Relationship to other studies - The green fescue plant association is reclassified from previous work in the Wallowa Mountains (Johnson and Simon 1987) and the Blue Mountains (Johnson and Clausnitzer 1992).

Table of Environmental Features
FEVI (n = 7)

	MEAN	RANGE
Elevation (ft)	7,481	7,230-7,920
Slope (%)	12	5-20
Soil pH		5.5-6.4
Soil available water capacity (inches)		5-13 inches (moderate to very high)
Thickness of volcanic ash	27 inches	12 to 44 inches
Depth to bedrock (inches)	41 inches	26 to 70 inches
Herbage (pounds/acre)	905	630-1,366
Aspect (no. of plots)	NW 2 NE 2 SE 1 SW 2	
Geology	Basalt	
Position	Ridgetop, upper slopes	
Relief	All	

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Grasses				
green fescue	FEVI	68	100	60-85
needlegrasses	STIPA	1	86	0-3
Sedges				
Hood's sedge	CAHO5	1	29	0-1
small winged sedge	CAMI7	1	29	0-3
Ross' sedge	CARO5	2	43	0-10
Forbs				
yarrow	ACMIL	1	57	0-5
pussytoes	ANTEN	2	71	0-5
western hawkweed	HIAL2	1	29	0-1
nodding microseris	MINU	1	57	0-5
penstemon	PENST	1	29	0-1
Oregon catchfly	SIOR3	1	29	0-3
spraguea	SPUM	1	29	0-1

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	10	100	1-20
Rock	1	71	0-1
Gravel	3	100	1-10
Pavement	7	57	0-20
Moss	1	14	0-1
Lichen	0	0	0
Litter	15	100	3-25

Green Fescue-Spurred Lupine Plant Association
Festuca viridula-Lupinus laxiflorus (FEVI-LULA3)



Bennet Peak, Wallowa Mountains Plot 1177

Distribution - Wallowa Mountains. Green fescue is found in isolated stands in the northern Blue Mountains as the only other part of the study area where the species occurs.

Environmental features - The plant association was found only on Columbia River basalts (Grande Ronde and Yakima Formations). Elevations ranged from 6,700 to 8,400 ft elevation (mean = 7,500 ft) in the Wallowa Mountains. One site in the Blue Mountains was sampled at 5,750 ft elevation. Slopes ranged from gentle to steep (10% to 65%) but were mostly moderate at 32%. The majority of sampled sites occurred on southerly aspects and primarily on ridgetop and upper slope positions. The sites were predominantly on convex relief.

Soils - Soils formed in volcanic ash and colluvium over bedrock. They have moderate available water capacity and pH can be as low as 4.6 near the surface but is generally 6.0 to 7.0 through most of the profile. Profiles consist of silt loam, sandy loam, loam, gravelly loam, or gravelly sandy loam (volcanic ash or mixed volcanic ash and colluvium) 15 to 43 inches thick, over extremely cobbly sandy loam. Bedrock lies below at a depth of 26 inches to more than our depth of observation (50 inches). (N = 11).

Vegetation composition - In this plant association, green fescue and lupines (spurred lupine - *Lupinus laxiflorus* predominantly; tailcup lupine - *Lupinus caudatus*) are the dominant plants. Of the grasses, the most commonly associated with green fescue are needlegrasses (especially western needlegrass - *Stipa occidentalis*). A short statured yarrow (*Achillea millefolium* var. *alpicola*) and asters (especially *A. integrifolius* - sticky aster) are the most frequently found forbs associated with the lupines in this type.

Successional relationships - In mid to late seral stands, green fescue averages 46% coverage (25% to 60%) with lupine, the most common associate, averaging 27% (10% to 55%). These relationships are reversed in early seral stands. Here lupines dominate (37%; 25% to 85% cover) and the fescue is subordinate (21%; 20% to 30% cover). Other herbaceous plants are associated at lower coverages. Needlegrasses (especially western needlegrass) are regularly associated and demonstrated increases with disturbance. In early seral stands, alpine fleecflower invaded highly disturbed areas in FEVI-LULA3 communities. Early seral sites are characterized as having twice as much bare ground (mean = 23%) as mid and late seral sites (mean = 10%).

Disturbance ecology - Lupines are increasers in FEVI-LULA3 plant associations. As overuse has occurred by cattle and elk, bare ground has increased providing fertile locations for quick occupancy by the aggressive lupines. Pocket gophers thrive in the more denuded rangeland where FEVI-LULA3 communities occur. Upwellings by the gophers provide other sites for occupancy by new lupine plants. During the sampling period of the mid 1980s to mid 1990s, elk use was high. Coupled with use by cattle on rangelands in the southern Wallowas, FEVI-LULA3 sites grazed by both elk and livestock demonstrated degraded site and vegetation composition.

Relationship to other studies - The green fescue-spurred lupine (FEVI-LULA3) plant association was previously classified for the Wallowa Mountains (Johnson and Simon, 1987).

Table of Environmental Features
FEVI-LULA3 (n = 25)

	MEAN		RANGE	
Elevation (ft)	7,458		6,770-8,400	
Slope (%)	32		10-65	
Soil pH			4.6 to 7.6	
Soil available water capacity (inches)			4.6 to 7 inches (moderate)	
Depth to bedrock (inches)			25 to more than 50 inches	
Herbage (pounds/acre)	1,077		580-1,900	
Aspect (no. of plots)	NW 2	NE 4	SE 9	SW 10
Geology	Basalt			
Position	Ridgetops, upper to mid slopes			
Relief	Convex, concave			

Table of Principal Species

SPECIES	CODE	All plots (n=26)			Mid Seral-Late Seral plots (n=17)			Early Seral plots (n=9)		
		% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE
Grasses										
bearded wheatgrass	AGCA2	1	19	0-10	1	18	0-10	1	22	0-5
mountain brome	BRCA5	1	15	0-3				1	44	0-3
green fescue	FEVI	37	100	20-60	46	100	25-60	21	100	20-30
oniongrasses	MELIC	1	15	0-10				1	22	0-10
needlegrasses	STIPA	5	69	0-20	4	71	0-20	7	67	0-20
Sedges										
Hood's sedge	CAHO5	1	38	0-10	1	35	0-10	1	44	0-1
Forbs										
yarrow	ACMIL	4	54	0-15	3	53	0-15	5	56	0-15
asters	ASTER	1	42	0-5	1	53	0-5	1	22	0-5
hawkweeds	HIERA	2	38	0-5	1	29	0-3	3	56	0-5
lupines	LUPIN	31	100	10-85	27	100	10-55	37	100	25-85
penstemons	PENST	1	23	0-5	1	18	0-5	1	33	0-1
alpine fleecflower	POPH	3	23	0-30				5	44	0-30
cinquefoils	POTEN	1	23	0-1				1	33	0-1

Table of Ground Surface Features

	All plots (n=26)			Mid Seral-Late Seral plots (n=17)			Early Seral plots (n=9)		
	% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE
Bareground	14	100	1-35	10	100	1-25	23	100	10-35
Rock	4	58	0-30	3	53	0-20	6	67	0-30
Gravel	3	65	0-20	3	71	0-20	4	56	0-10
Pavement	4	31	0-20	3	35	0-20	4	22	0-20
Moss	1	8	0-5	1	12	0-5	0	0	0
Lichen	0	0	0	0	0	0	0	0	0
Litter	30	96	1-90	38	100	1-90	17	89	1-40

Green Fescue-Parry's Rush Plant Association
***Festuca viridula*-*Juncus parryi* (FEVI-JUPA)**



Boner Flat, Eagle Cap Wilderness, Wallowa Mountains Plot 6043



Distribution - Wallowa Mountains.

Environmental features - The plant association is normally associated with basaltic-derived soils of the Grande Ronde and Yakima Formations. Some sampled sites occurred on granitic-derived soils. These communities were able to persist owing to compensating environmental

features (i.e., lower slope, toe slopes, and edge of meadow locations). Elevations ranged from 6,800 to 8,000 ft (mean = 7,500 ft). This association was usually on gentle to moderate slopes and ridgetops (mean = 26%) on convex microtopography. All aspects were represented on sampled sites.

Soils - Soils formed in a mixture of volcanic ash, loess, and colluvium over bedrock (or, in one case, dense glacial till). Available water capacity was moderate and pH 5.5 to 7.5. These soils are more coarse grained and hold less water than many other green fescue soils. Profiles consisted of a surface layer of gravelly or cobbly silt loam, loam, or sandy loam (occasionally with few coarse fragments) 24 to 47 inches thick over bedrock or 13 to 20 inches thick over very gravelly, very cobbly, or extremely bouldery sandy loam till and colluvium. (N = 6).

Vegetation composition - Parry's rush defines this association with green fescue. This is the most xeric of the three green fescue plant associations. Lupines are replaced by the more drought-tolerant and heat-tolerant Parry's rush. Erosion pavement and bare ground are populated by the colonization of pussytoes (*Antennaria lanata* - woolly pussytoes and *A. alpina* - alpine pussytoes). Penstemons (especially *P. globosus* - globe penstemon) are commonly found on the well-drained, rocky portions of FEVI-JUPA sites.

Successional relationships - Green fescue was dominant to codominant with Parry's rush in late to mid seral stands. Other grasses, sedges, and forbs were low in cover (averaging less than 5%) in late to mid seral communities.

In early seral stands, Parry's rush dominated over fescue in a 4:1 ratio. The abundance of Parry's rush averaged about the same as in late to mid seral stands (25%). The decline was in average green fescue cover (31% decline to 6%). Forbs were the occupants of the sites where green fescue succumbed to disturbances. Prominent increasing forbs were pussytoes, asters, and globe penstemon.

In very early seral communities, green fescue cover was 5% or less. Parry's rush remained constant at 25% to 75% cover. Aggressive colonizers invaded disturbed sites (i.e., alpine fleecflower, linanthastrum, and pale agoseris).

Disturbance ecology - As with other green fescue grasslands, FEVI-JUPA communities were subjected to severe, intense overgrazing by domestic sheep in the early 1900s. Grazing has continued with elk exerting heavy usage in the 1980s as their population increased and their movements were continually restricted to higher elevation sanctuaries. Secondary disturbances were created by burrowing animals (i.e., Columbia ground squirrel, northern pocket gopher). Winds and storms sculpted these high subalpine sites leaving erosion pavement to protect residual soils. The pioneering plants on deflation sites, where erosion pavement occurred were pussytoes, prickly sandwort, penstemons, and sibbaldia.

Relationship to other studies - The green fescue-Parry's rush plant association has not been previously described.

Table of Environmental Features
FEVI-JUPA (n = 14)

	MEAN		RANGE			
Elevation (ft)	7,500		6,800-8,050			
Slope (%)	26		5-50			
Soil pH			5.5 to 7.5			
Soil available water capacity (inches)			5 to 6 inches (moderate)			
Depth to bedrock (inches)			24 to more than 39 inches			
Herbage (pounds/acre)	910		611-1,267			
Aspect (no. of plots)	NW 2	NE 4	SE 4	SW 4		
Geology	Basalt, granitic					
Position	All					
Relief	Mostly convex					

Table of Principal Species

SPECIES	CODE	All plots (n=14)			Late Seral-Mid Seral plots (n=10)			Early Seral-Very Early Seral plots (n=4)		
		% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE
Grasses										
green fescue	FEVI	23	100	1-50	31	100	10-50	6	100	1-15
western needlegrass	STOC	1	50	0-10	1	50	0-1	2	50	0-10
Sedges										
Hood's sedge	CAHO5	1	29	0-10	2	30	0-10	1	25	0-3
Ross' sedge	CARO5	1	43	0-10	1	40	0-5	1	50	0-10
Parry's rush	JUPA	25	100	5-45	25	100	5-40	25	100	10-45
Forbs										
yarrow	ACMIL	1	21	0-15	1	10	0-5	1	50	0-15
pussytoes	ANTEN	5	71	0-25	2	70	0-5	12	75	0-25
prickly sandwort	ARAC2	1	43	0-3	1	50	0-1	1	25	0-3
asters	ASTER	2	50	0-15	2	50	0-15	3	50	0-15
golden buckwheat	ERFL4	1	29	0-5	1	20	0-3	2	50	0-5
hawkweeds	HIER	1	50	0-3	1	60	0-3	1	25	0-3
penstemons	PENST	5	43	0-35	3	40	0-25	9	50	0-35
alpine fleecflower	POPH	2	43	0-25	1	40	0-1	7	50	0-25
cinquefoils	POTEN	1	21	0-1	1	30	0-1	0	0	0
creeping sibbaldia	SIPR	2	21	0-25	3	20	0-25	1	25	0-3

Table of Ground Surface Features

	All plots (n=14)			Late Seral-Mid Seral plots (n=10)			Early Seral-Very Early Seral plots (n=4)		
	% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE
Bareground	12	93	0-35	8	90	0-30	23	100	10-30
Rock	7	93	0-20	6	100	1-15	10	75	0-20
Gravel	3	43	0-25	4	60	0-25	0	0	0-5
Pavement	10	79	0-35	10	80	0-35	13	75	0-35
Moss	3	64	0-20	5	80	0-20	1	25	0-3
Lichen	1	14	0-1	1	20	0-1	0	0	0-1
Litter	14	100	0-40	13	100	1-40	14	100	0-30

Green Fescue-Ross' Sedge Plant Community Type
Festuca viridula-Carex rossii (FEVI-CARO5)



Near Miner Basin, Eagle Cap Wilderness, Wallowa Mountains Plot 6233

Distribution - Wallowa Mountains.

Environmental features - The type was found only in the Wallowa Mountains. It occurred on Columbia River basaltic substrates and limestones on varying microtopography. Aspects were generally southerly. Slopes were gentle to moderate (5% to 40%; mean = 23%). Elevations of sampled sites ranged from 7,000-8,300 ft (mean = 7,756 ft).

Vegetation composition - In this plant community type, Ross' sedge is strongly associated with green fescue. These are productive grasslands where the presence of Ross' sedge at greater than 10% coverage indicates mesic growing conditions. In this type lupines, rushes, and penstemons are absent or weakly present. Needlegrasses are usually present. Other forbs of high constancy are yarrow, pussytoes, and fleabanes.

Successional relationships - The FEVI-CARO5 plant community type represents vegetation and sites that have been disturbed. Mid seral stands were dominated by green fescue on large hummocks pedestalled 6 to 8 inches above deflation depressions. The depressions contained Ross' sedge, pussytoes, and spraguea. Early seral sites had reduced foliar cover of green fescue, increased cover by western needlegrass (mean = 10%), yarrow, golden buckwheat, and Liddon's sedge. Western coneflower is invasive in highly disturbed communities.

Disturbance Ecology - A long-term monitoring site on Washboard Ridge had received high use by domestic sheep historically. At the time of establishment of vegetation transects in 1965, the vegetation was at a mid seral stage. In 1993, the vegetation had changed with increases in Hood's sedge, needlegrass, and coneflower owing to the decline in green fescue cover. Bare ground had markedly increased as well. The site had dropped one condition class to early seral stage. This change was attributed to heavy elk use early in the season throughout the 1980s.

Relationship to other studies - This plant community type has not been described previously.

Table of Environmental Features
 FEVI-CARO5 (n = 5)

	MEAN		RANGE	
Elevation (ft)	7,756		7,010-8,340	
Slope (%)	23		5-40	
Aspect (no. of plots)	NW 1	NE 0	SE 2	SW 2
Geology	Basalt, limestone			
Position	Ridgetops, upper slopes, flats			
Relief	Convex, flat, complex			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Grasses				
mountain brome	BRCA5	1	20	0-5
green fescue	FEVI	31	100	20-45
western needlegrass	STOC	8	100	1-15
Sedges				
Hood's sedge	CAHO5	3	20	0-15
Liddon's sedge	CAPE7	6	40	0-30
Ross' sedge	CARO5	12	100	10-20
Forbs				
yarrow	ACMIL	9	80	0-25
pale agoseris	AGGL	1	40	0-1
large flowered agoseris	AGGR	4	20	0-20
pussytoes	ANTEN	1	80	0-3
prickly sandwort	ARAC2	3	20	0-15
fleabanes	ERIGE2	2	60	0-5
golden buckwheat	ERFL4	5	40	0-25
penstemons	PENST	2	80	0-5
western coneflower	RUOC2	2	20	0-10
spraguea	SPUM	1	40	0-1

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	24	100	10-40
Rock	1	80	0-1
Gravel	1	60	0-3
Pavement	3	20	0-15
Moss	0	0	0
Lichen	0	0	0
Litter	16	100	1-60

Green Fescue-Hood's Sedge Plant Community Type
Festuca viridula-Carex hoodii (FEVI/CAHO5)



Imnaha - Elk Creek Divide, Wallowa Mountains Plot 1070



Distribution - Wallowa Mountains.

Environmental features - This plant community type occurs in the Wallowa Mountains between 5,900 and 7,000 ft elevation (mean = 6,360 ft). It occupies interforest clearings where ungulate use has severely overgrazed the green fescue communities. Sampled sites were on

moderate slopes (mean = 22%), southerly aspects, and on ridgetop and upper slope locations. Substrates were derived from Columbia River basalts.

Soils - The single soil studied consisted of loess over colluvium and limestone bedrock, with moderate available water capacity (5 inches) and pH of 5.5 to 7.0. The profile consisted of loam and fine sandy loam 17 inches thick, over cobbly fine sandy loam. Bedrock was at 35 inches deep.

Vegetation composition - This moist site green fescue type formed "meadow-like" communities on seepy sideslopes, deep soil ridgetops, and in interforest meadows. Hood's sedge dominated over green fescue by a 2:1 ratio. Also occurring in abundance were penstemons (especially *P. attenuatus* - taper-leaved penstemon; *P. payettensis* - Payette penstemon). Showy oniongrass always occurred at lower coverages. Lupines (especially *L. caudatus* - tailcup lupine) and needlegrasses added to a "weedy" assemblage of plants.

Successional relationships - Hood's sedge probably increased as a result of fescue overgrazing by domestic sheep. In very early seral stands of this type, green fescue is present at less than 5% coverage. Hood's sedge dominates with coverages as high as 30%, and invasive plants occupy the bare ground as it is exposed. Blue stickseed and western coneflower often form dense patches on highly disturbed sites.

Disturbance ecology - Domestic livestock (sheep, cattle, horses) and wild ungulates (especially elk) have been the principal disturbance agents impacting this plant community type. In very early seral stands green fescue and associated grasses (oniongrass, mountain brome, and needlegrasses) have been virtually eliminated from the grazing pressure. Hood's sedge and coneflower occupy 50% of the site; bare ground occupies 25%; and penstemon, stickweed, and sedges that thrive on soil disturbance occupy the final 25% as an example of the very early stage.

Relationship to other studies - The green fescue - Hood's sedge plant community type was previously classified for the Wallowa Mountains (Johnson and Simon 1987).

Table of Environmental Features
FEVI-CAHO5 (n = 4)

	MEAN		RANGE	
Elevation (ft)	6,360		5,940-6,960	
Slope (%)	22		15-35	
Aspect (no. of plots)	NW 0	NE 0	SE 2	SW 2
Geology	Basalts			
Position	Ridgetops, upper slopes			
Relief	Convex, flat			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Grasses				
mountain brome	BRCA5	2	75	0-5
green fescue	FEVI	12	100	1-20
showy oniongrass	MESP	4	100	1-5
needlegrasses	STIPA	6	75	0-15
Sedges				
sedges	CAREX	2	50	0-5
Hood's sedge	CAHO5	23	100	10-40
Forbs				
yarrow	ACMIL	1	75	0-3
asters	ASTER	2	50	0-5
blue stickseed	HAJE	2	75	0-5
lupines	LUPIN	8	75	0-20
penstemons	PENST	26	100	15-35

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	20	100	1-35
Rock	2	75	0-5
Gravel	3	75	0-10
Moss	1	25	0-5
Lichen	0	0	0
Litter	31	100	3-65

Green Fescue-Penstemon Plant Community Type *Festuca viridula*-*Penstemon* (FEVI/PENST)



Standley Research Natural Area (proposed), Eagle Cap Wilderness,
Wallowa Mountains Plot 6229



Distribution - Wallowa Mountains.

Environmental features - This plant community type was found on Columbia River basalts and limestone-derived substrates. Sampled sites ranged from 6,250 to 7,960 ft (mean = 7,200 ft) in elevation. Slopes were gentle to steep (mean = 24%). Aspects were dominantly southerly.

Sampled sites occurred on all topographic positions on convex, straight, or flat surfaces.

Soils - The two soils studied were rather different. One was in thick coarse-grained colluvium mixed with ash and had low available water capacity (3.5 inches). This profile was very to extremely gravelly and stony silt loam to a depth beyond the depth of observation. The other soil had a substantial ash layer over weathered bedrock and a high available water capacity (10.6 inches). This profile was 17 inches of very fine sandy loam, loam, and silt loam over gravelly and cobbly silt loam and loam, with bedrock at 50 inches deep. The pH in both cases was 6.0 to 7.0. (N = 2).

Vegetation composition - Penstemon codominated with green fescue in these degenerated communities. Coverages averaged 30% for green fescue and 25% for penstemons. The principal penstemons occurring in these communities were *P. attenuatus* - taper-leaved penstemon; *P. globosus* - globe penstemon; *P. procerus* - small-flowered penstemon. In this type, lupine is present in low coverages (average less than 3%), and there is no Parry's rush, Ross' sedge, or Hood's sedge.

Successional relationships - The successional pathways are unclear. These plant communities could be degenerated from late seral FEVI or FEVI-LULA3 plant associations. Early seral communities were found with lower coverage by green fescue and higher coverage by Liddon's sedge, linanthastrum, and cinquefoils. Bare ground increased by a 5:1 ratio (33%:6%) on early seral sites over mid seral sites. Alpine pokeweed is invasive in some early seral stands. Very early seral stands contain greater coverage by penstemon and less than 5% cover by green fescue.

Disturbance ecology - These subalpine green fescue - penstemon communities were intensively used by domestic sheep in the early 1900s. Here, as in other green fescue grasslands, bare ground was often lost to erosion resulting in erosion pavement, pedestalled islands of fescue, and deflation depressions. Aggressive colonization occurred by linanthastrum, alpine pokeweed, and other opportunists on these highly disturbed microsites.

Relationship to other studies - This plant community type has not been previously described.

Table of Environmental Features
FEVI-PENST (n = 8)

	MEAN			RANGE				
Elevation (ft)	7,201			6,250-7,960				
Slope (%)	24			10-50				
Herbage (pounds/acre)	840			620-1,050				
Aspect (no. of plots)	NW	0	NE	1	SE	1	SW	6
Geology	Basalts, limestone							
Position	All							
Relief	Convex, flat							

Table of Principal Species

SPECIES	CODE	All plots (n=8)			Mid Seral plots (n=4)			Early Seral plots (n=2)		
		% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE
Grasses										
green fescue	FEVI	32	88	0-50	41	100	25-50	33	100	100
western needlegrass	STOC	2	50	0-5	2	50	0-5	3	100	100
Sedges										
many ribbed sedge	CAMU6	4	38	0-15	4	50	0-15	0	0	0
Liddon's sedge	CAPE7	2	25	0-13	0	0	0	9	100	100
Forbs										
yarrow	ACMIL	2	38	0-10	1	50	0-3	0	0	0
asters	ASTER	5	63	0-20	9	75	0-20	2	50	50
linanthastrum	LINU4	5	38	0-20	5	25	0-20	10	100	100
lupines	LUPIN	2	38	0-10	1	25	0-3	4	50	50
penstemons	PENST	25	100	15-45	21	100	15-25	19	100	100
alpine fleecflower	POPH	2	38	0-9	2	50	0-5	5	50	50
cinquefoils	POTEN	2	38	0-9	1	25	0-1	5	50	50

Table of Ground Surface Features

SPECIES	All plots (n=8)			Mid Seral plots (n=4)			Early Seral plots (n=2)		
	% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE
Bareground	14	100	3-35	6	100	5-10	33	100	31-35
Rock	3	63	0-10	5	75	0-10	3	50	0-5
Gravel	4	63	0-25	7	75	0-25	0	0	0
Pavement	3	38	0-20	6	50	0-20	0	0	0
Moss	4	13	0-35	0	0	0	0	0	0
Lichen	0	0	0	0	0	0	0	0	0
Litter	30	100	1-70	40	100	5-70	24	100	20-27

Green Fescue-Western Needlegrass Plant Community Type
***Festuca viridula-Stipa occidentalis* (FEVI/STOC)**



Norway Basin, Eagle Cap Wilderness, Wallowa Mountains Plot 6140



Distribution - Wallowa Mountains.

Environmental features - This plant community type was primarily found on substrates of Columbia River basalts. It also occurred on limestone derived soils of the Martin Bridge Formation. Elevations ranged from

6,600 to 7,900 ft elevation (mean = 7,500 ft). Slopes were gentle to steep (mean = 29%). Sampled sites occurred principally on southerly aspects. Topographic settings varied from ridgetops to canyon bottoms. The majority of the sites sampled were at the upper slope positions of ridges. Most of the sites were on convex surfaces.

Soils - Soils consisted of volcanic ash and loess over residuum or colluvium, over bedrock. Available water capacities were moderate to high and pH values from 6.0 to 7.5. Profiles consisted of fine sandy loam, loam, or gravelly loam 17 to 30 inches thick, over very to extremely gravelly or cobbly loamy soil. Bedrock was as shallow as 32 inches deep in one case, but in the others was at 55 or more inches deep. (N = 4).

Vegetation composition - These grasslands are dominated by green fescue, needlegrasses, and bare ground. Only Ross' sedge and yarrow are consistent associates at lower coverages.

Successional relationships - These communities are a result of overgrazing and resultant soil surface desiccation. These southerly sites are too warm, and too dry for establishment of lupines and penstemons. The successional pathways to late seral stages of green fescue plant association is unknown. A seral stage portrayal would have green fescue dominating over needlegrasses at a 2:1 ratio at mid sere. The early seral stage would have lower coverage levels of the grasses than at mid sere. A reversal in dominance by needlegrass over green fescue would occur in very early seral stages. Green fescue cover was 5% or less at the very early seral stage. Forbs that tended to increase, or invade, at earlier seral stages were alpine fleecflower, yarrow, and golden buckwheat.

Disturbance ecology - These subalpine sites were used intensively by domestic sheep in the early 1900s. Sites sampled in the late 1980s to mid 1990s were heavily used by elk. The deflation depressions resulted from wind erosion that was associated with the fescue on hummocks. The needlegrasses and yarrow occupy the degraded fescue community on the hummock. The deflation depressions contain gravels, erosion pavement, Ross' sedge, Parry's rush, and spraguea. Pocket gopher disturbance provides bare soil for fleecflower invasion and occupancy.

Relationship to other studies - This plant community type has not been previously classified.

Table of Environmental Features
FEVI-STOC (n = 10)

	MEAN		RANGE	
Elevation (ft)	7,514		6,580-7,890	
Slope (%)	29		10-60	
Soil pH			6.0 to 7.5	
Soil available water capacity (inches)			6.5 to 12 inches (moderate to very high)	
Thickness of volcanic ash	24 inches		17 to 30 inches	
Depth to bedrock (inches)			32 to more than 60 inches	
Herbage (pounds/acre)	760		460-1,116	
Aspect (no. of plots)	NW 1	NE 1	SE 4	SW 4
Geology	Basalt, limestone			
Position	Ridgetop, slopes, flats			
Relief	All			

Table of Ground Surface Features

SPECIES	All plots (n=10)			Mid Seral plots (n=3)			Early Seral plots (n=2)			Very Early Seral plots (n=5)		
	% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE
Bareground	23	100	10-50	12	100	10-15	26	100	20-32	29	100	12-50
Rock	7	90	0-35	2	100	1-5	8	100	5-11	9	80	0-35
Gravel	6	80	0-15	2	100	1-5	0	0	0	9	100	3-15
Pavement	2	30	0-15	5	33	0-15	1	50	0-1	1	20	0-3
Moss	2	30	0-10	1	33	0-3	5	50	0-10	1	20	0-3
Lichen	1	10	0-3	0	0	0	0	0	0	1	20	0-3
Litter	26	100	5-60	18	100	15-25	26	100	22-30	30	100	13-60

Table of Principal Species

SPECIES	CODE	All plots (n=10)			Mid Seral plots (n=3)			Early Seral plots (n=2)			Very Early Seral plots (n=5)		
		% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE	% COVER	% CONSTANCY	RANGE
Grasses													
green fescue	FEVI	23	90	0-45	43	100	30-45	36	100	35-37	5	80	0-5
western needlegrass	STOC	29	100	10-60	20	100	15-25	15	100	10-19	39	100	35-60
spike trisetum	TRSP2	1	30	0-5	1	33	0-1	1	50	0-1	1	20	0-5
Sedges and Rushes													
Hood's sedge	CAHO5	1	30	0-3	1	67	0-1	0	0	0	1	20	0-3
Liddon's sedge	CAPE7	1	20	0-19	0	0	0	0	0	0	4	20	0-19
Ross' sedge	CARO5	2	60	0-8	1	100	1-1	2	50	0-5	2	40	0-8
Parry's rush	JUPA	1	30	0-11	1	67	0-1	6	50	0-11	0	0	0
Forbs													
yarrow	ACMIL	4	60	0-25	3	33	0-10	13	100	1-25	2	60	0-5
golden buckwheat	ERFL4	1	30	0-10	0	0	0	6	100	1-10	1	20	0-2
penstemons	PENST	1	30	0-4	1	67	0-1	2	50	0-4	0	0	0
alpine fleecflower	POPH	3	40	0-30	1	67	0-1	0	0	0	6	40	0-30
spraguea	SPUM	1	30	0-1	1	33	0-1	1	100	1-1	0	0	0

GREEN FESCUE COMMUNITIES

Green Fescue-Canby's Lovage Plant Community

Festuca viridula-Ligusticum canbyi (FEVI-LICA2) (n = 1)

This community contained green fescue with only one other associated plant of prominence. Canby's lovage (*Ligusticum canbyi*) occupied 20% of the total vegetation coverage, whereas green fescue occupied 70% of the total plant cover. Cosmetically these communities appeared as undisturbed grasslands. However, 40% to 50% of the sites contained erosion pavement, bare ground, and gravels from overgrazing and resultant wind erosion. These sites, as with most in the subalpine green fescue grasslands, has been previously degraded from sheep, cattle, and elk overuse. The type locality was at 7,740 ft elevation on a 60% NE-facing slope on Columbia River basalts (Sugarloaf Mountain, Wallowa Mountains). The soil there was formed in volcanic ash or loess and weathered bedrock, with moderate available water capacity (4.5 inches). The profile was 19 inches of very gravelly silt loam over extremely stony silt loam.

Green Fescue-Bearded Wheatgrass Plant Community

Festuca viridula-Agropyron caninum (FEVI-AGCA2) (n = 1)

This highly grass-dominated (75%) community was dominated by green fescue with a strong associate in bearded wheatgrass (20%). The only other major plant species occurring in the grassland was creamy buckwheat. The nonvegetated surface of the site exhibited a low level of disturbance. Bare ground covered only 15% of the site. The type locality was at 7,840 ft elevation on a 40% SE-facing slope on Columbia River basalts (near Sentinel Peak, Wallowa Mountains). The soil here was formed in loess and weathered shale bedrock (sandy loam through the depth of observation to 40 inches), with moderate available water capacity (about 6 inches).

Green Fescue-Holm's Rocky Mountain Sedge Plant Community

Festuca viridula-Carex scopulorum (FEVI-CASC12) (n = 3)

This is "meadow steppe" where mesic plant species found in meadows occur with more xeric plants in upland settings. The mesic plant is Holm's Rocky Mountain Sedge, whereas the drier-site (xeric) plants are green fescue, lupines, Cusick's bluegrass, and cinquefoils. Green fescue was highly associated with tailcup lupine and Holm's sedge in mid seral stands. In early seral stands, needlegrass and pussytoes were strong components with fescue and sedge. On highly degraded sites (very early seral stage) fescue was subordinate in cover to the sedge, western needlegrass, lupines, and pale agoseris. Active in impacting these sites in the early 1990s were elk and ground squirrels. Typical localities were on Columbia River basaltic substrates. Elevations averaged 8,200 ft. Slopes ranged from 15% to 60% (Imnaha Divide, Granite Gulch, Goat Mountain - Wallowa Mountains). The single soil studied consisted of ash or loess, over colluvium and residuum from basalt, over basalt bedrock, with moderate available water capacity (5 inches). The profile was 18 inches of loam and gravelly silt loam, over very to extremely cobbly fine sandy loam, with bedrock at 30 inches deep. The pH was 6 to 7.

Idaho Fescue-Timber Oatgrass-Liddon's Sedge Plant Association
Festuca idahoensis-Danthonia intermedia-Carex petasata
(FEID-DAIN-CAPE7)



Fire Camp Saddle, Seven Devils Mountains Plot 7070



This describes the subalpine representation of the Idaho fescue - timber oatgrass - sedge plant association found in the Seven Devils Mountains of Idaho. This plant association also occurs at lower elevations in the Snake River Canyon and was previously classified (Johnson and Simon 1987). It occupies ridgetops and upper slope positions on metabasaltic substrates at lower subalpine elevations (mean = 7,400 ft). Slopes ranged from gentle to moderate with convex, concave, or flat surfaces.

These communities are dominated by Idaho fescue with timber oatgrass strongly associated. Prairie junegrass may be present. Sedges are a component with Liddon's sedge indicative of the type. Late seral stands are highly dominated by graminoids with pussytoes and yarrow the prominent forbs. Mid seral stands show increases by oatgrass and codominance with fescue. Increasing forbs with disturbance are lupines (especially tailcup lupine) and golden buckwheat. If present, red avens will increase from lower coverages with disturbance. Early seral stands contained high coverages by invasive needlegrasses.

Stands with 15% to 25% oatgrass are common. Ridgetops where this type occurs, and where heavy grazing has occurred, are low in fescue with increased coverage by oatgrass and sedges. Needlegrass is not capable of persisting on these sites unless the sod is broken and competition with fescue and oatgrass is reduced.

This plant association occurs on the wetter, cooler microclimatic end of the Idaho fescue series.

Table of Environmental Features
FEID-DAIN-CAPE7 (n = 2)

	MEAN		RANGE	
Elevation (ft)	7,420		7,180-7,660	
Slope (%)	22		10-35	
Herbage (pounds/acre)	565			
Aspect (no. of plots)	NW 1	NE 0	SE 0	SW 1
Geology	Metabasalts			
Position	Ridgetop; upper 1/3			
Relief	Convex, flat, concave			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Grasses				
Idaho fescue	FEID	55	100	40-70
timber oatgrass	DAIN	28	100	10-45
prairie junegrass	KOCR	3	50	0-5
Sedges				
Liddon's sedge	CAPE7	8	100	5-10
Forbs				
ballhead sandwort	ARCO5	2	100	1-3
pussytoes	ANTEN	12	100	5-20
tailcup lupine	LUCA	5	100	1-10
red avens	GETR	3	50	0-5
golden buckwheat	ERFL4	10	100	10-10
yarrow	ACMIL	14	100	3-25
glanduler cinquefoil	POARC	5	50	0-10

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	1	100	1-1
Rock	0	0	0
Gravel	3	100	3-3
Moss	3	100	1-5
Lichen	1	100	1-1
Litter	1	100	1-1

Idaho Fescue-Prairie Junegrass (High Elevation) Plant Association
Festuca idahoensis-Koeleria cristata (FEID-KOCR)



Mt. Howard, Eagle Cap Wilderness, Wallowa Mountains Plot 6290



This plant association occurs from 3,800 to 8,200 ft in the canyons and mountains of northeast Oregon (Johnson and Simon 1987). These sampled sites represent the higher elevation ridgetops (mean = 7,100 ft) where prairie junegrass is associated with Idaho fescue. At

approximately 8,200 ft elevation, prairie junegrass reaches the upper elevational limits of its range in the Wallowa Mountains. It was found associated with Idaho fescue and bluebunch wheatgrass on moderately steep slopes (mean = 28%) on basaltic and granitic substrates. Elk sedge was often a component owing to the cooler, moister microenvironment of these high ridgetop locations. In late seral stages, Idaho fescue dominated over bluebunch wheatgrass (2:1 ratio) and elk sedge (3:2 ratio). In mid seral stands prairie junegrass and elk sedge dominated over Idaho fescue at 3:1 ratios, respectively. Prickly sandwort was the most prominent forb in late seral stands (10%). Ungulates utilize vegetation on these ridgetop locations in late spring to early summer.

Table of Environmental Features
FEID-KOCR (High) (n = 3)

	MEAN		RANGE	
Elevation (ft)	7,103		6,350-8,190	
Slope (%)	28		20-35	
Aspect (no. of plots)	NW 0	NE 0	SE 1	SW 2
Geology	Basalt, quartzdiorite			
Position	Ridgetop			
Relief	Convex, concave			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Grasses				
Idaho fescue	FEID	27	100	10-40
bluebunch wheatgrass	AGSP	8	67	0-15
Sandberg's bluegrass	POSA12	3	33	0-10
prairie junegrass	KOCR	11	100	1-30
Sedges				
elk sedge	CAGE2	13	67	0-25
Forbs				
yarrow	ACMIL	11	100	3-25
lupine	LUPIN	10	33	0-30
groundsel	SENEC	5	67	0-10
red avens	GETR	2	33	0-5
ballhead sandwort	ARCO5	7	33	0-10
Eaton's daisy	EREA	3	33	0-10

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	5	100	1-10
Rock	5	100	1-10
Gravel	18	100	5-40
Moss	7	67	0-15
Lichen	2	67	0-5
Litter	30	100	5-70

Idaho Fescue-Red Avens Plant Community Type
Festuca idahoensis-Geum triflorum (FEID-GETR)



Near Marble Pass, Elkhorn Mountains Plot B0797

The sampled sites represent ridgetop locations high in elevation (mean = 7,600 ft) where bluebunch wheatgrass and prairie junegrass are unable to persist. Sites were in the Wallowa Mountains on basaltic substrates on gentle to moderate slopes (mean = 18%), in the Elkhorn Mountains on argillites, and at Dixie Butte on andesites. No sedges occurred. Only forbs were associated with fescue. Lupines, penstemon, and yarrow represented species that tended to increase with ungulate disturbance. Red avens and western groundsel were prominent associates. On depressions and thinner soil microsites, pussytoes, scabland fleabane, and buckwheat were found. Mosses were abundant. Erosion pavement was always present at 5% to 10%. The FEID-GETR plant community type has not been previously described.

Table of Environmental Features
 FEID-GETR (n = 4)

	MEAN		RANGE			
Elevation (ft)	7,633		7,620-8,080			
Slope (%)	23		15-20			
Aspect (no. of plots)	NW 2	NE 0	SE 0	SW 2		
Geology	Basalt					
Position	Ridgetop					
Relief	Convex					

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Grasses				
Idaho fescue	FEID	44	100	40-50
Forbs				
lupine	LUPIN	11	75	0-30
western groundsel	SEIN2	5	50	0-10
red avens	GETR	18	100	10-30
yarrow	ACMIL	8	100	5-20
penstemon	PENST	2	50	0-5
golden buckwheat	ERFL4	1	50	0-1
pussytoes	ANTEN	7	100	1-1
scabland fleabane	ERBL	2	75	0-4
woolly goldenweed	HALA3	1	50	0-1
phlox	PHLOX	4	25	0-15
creamy buckwheat	ERHE2	3	25	0-10

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	7	75	0-15
Rock	7	100	5-10
Gravel	2	50	0-5
Pavement	9	100	5-10
Moss	11	100	5-18
Lichen	1	25	0-1
Litter	5	50	0-15

Idaho Fescue-Wallowa Penstemon Plant Community Type
***Festuca idahoensis*-*Penstemon spatulatus* (FEID-PESP2)**



East Peak (north), Eagle Cap Wilderness, Wallowa Mountains Plot 6278



moderately steep slopes (mean = 30%), on convex or flat surfaces at ridgetop or upper slope positions. Idaho fescue occurred as the dominant bunchgrass. Bluebunch wheatgrass was not present. The only other bunchgrasses found were bottlebrush squirreltail and bluegrasses (e.g., Cusick's, Sandberg's and alpine). Plants favoring strong, well-drained soils were dominant among the forbs (e.g., Wallowa penstemon, prickly sandwort, oval-leaved eriogonum, long-stalked clover, and pussytoes). Two species of pussytoes occurred in these communities (*Antennaria rosea* and *A. umbrinella*). Ground surfaces were high in coverage by rock, gravel, and bare soil (mean = 60%). The FEID-PESP2 plant community type has not been previously described.

Table of Environmental Features
FEID-PESP2 (n = 3)

	MEAN		RANGE					
Elevation (ft)	8,443		7,270-9,290					
Slope (%)	30		10-45					
Aspect (no. of plots)	NW	0	NE	0	SE	2	SW	1
Geology	Basalt							
Position	Ridgetop, upper 1/3 slope							
Relief	Convex, flat							

These Idaho fescue communities are endemic to the Wallowa Mountains on basaltic substrates. Soils derived from basaltic parent material were shallow and stony for this type. On deeper, less stony soils in the Wallowa Mountains, green fescue achieves its potential and outcompetes Idaho fescue for occupancy. Elevations ranged from 7,300 to 9,300 ft (mean = 8,400 ft). Sampled sites were on southerly, gentle to

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Grasses				
Idaho fescue	FEID	23	100	20-25
bluegrasses	POA	1	100	1-3
bottlebrush squirreltail	SIHY	1	67	0-3
Forbs				
yarrow	ACMIL	7	100	5-10
Wallowa penstemon	PESP2	9	100	3-15
pussytoes	ANTEN	6	100	1-15
prickly sandwort	ARAC2	2	100	1-3
woolly groundsel	SECA2	2	67	0-5
oval-leaved eriogonum	EROV	1	67	0-3
long-stalked clover	TRL0M3	3	67	0-5
Douglas' campion	SIDO	1	67	0-3
alpine goldenrod	SOMUS2	2	67	0-5

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	5	100	1-10
Rock	20	100	10-30
Gravel	35	100	30-40
Moss	2	33	0-5
Lichen	1	33	0-3
Litter	6	100	1-15

Idaho Fescue-Hood's Sedge Plant Community Type
Festuca idahoensis-Carex hoodii (FEID-CAHO5)



Horse Heaven Meadow, Seven Devils Mountains Plot 7011



The high-elevation Idaho fescue-dominated grasslands in the Seven Devils Mountains often contain Hood's sedge as a codominant. These grasslands are common on the substrates derived from metavolcanics (greenstones). Sampled sites were on flat to convex ridgetops or upper montane slopes. All sites were southwesterly where exposures and substrates favor grasslands. Elevations ranged from 7,300-8,100 ft (mean = 7,800 ft). Slopes were gentle to steep (mean = 30%).

Idaho fescue averaged 30% in mid seral stands; 15% in early seral stands. Hood's sedge was codominant with fescue in mid seral stages; relict in earlier seral stands. In later seral stands, mountain brome was a key grass component. In earlier seral stands, western needlegrass and showy oniongrass were present, often with high coverages.

Key forbs prevalent in FEID-CAHO5 plant communities were penstemons, asters, lupines, buckwheats (creamy and golden) and the ubiquitous yarrow. Principal increasing forbs were tailcup lupine, creamy buckwheat, leafy and thick-stemmed asters, silverleaf phacelia, and yarrow. An erosion pavement was always present from high snowmelt runoff. These sites were once heavily overgrazed by domestic sheep. The FEID-CAHO5 plant community type was previously described for the Seven Devils and the Wallowa Mountains (Johnson and Simon 1987).

**Table of Environmental Features
FEID-CAHO5 (n = 4)**

	MEAN		RANGE	
Elevation (ft)	7,802		7,350-8,070	
Slope (%)	30		10-55	
Herbage (pounds/acre)	752			
Aspect (no. of plots)	NW 0	NE 0	SE 0	SW 4
Geology	Metabasalts			
Position	Ridgetop; upper 1/3 slopes			
Relief	Convex, flat			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Grasses				
Idaho fescue	FEID	30	100	10-50
mountain brome	BRCA5	3	50	0-10
western needlegrass	STOC	8	50	0-10
spike trisetum	TRSP2	2	50	0-1
Cusick's bluegrass	POCUE2	2	50	0-1
Sedges				
Hood's sedge	CAHO5	30	100	15-45
Forbs				
yarrow	ACMIL	12	100	10-15
golden buckwheat	ERFL4	10	50	5-15
creamy buckwheat	ERHE2	12	50	0-25
lupines	LUPIN	12	50	0-25
Oregon catchfly	SIOR3	5	50	0-10
globe penstemon	PEGL5	2	50	0-5

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	1	100	1-1
Rock	1	50	0-3
Gravel	1	50	0-1
Pavement	5	100	1-10
Moss	0	0	0
Lichen	0	0	0
Litter	3	100	1-5

Idaho Fescue-Bluebunch Wheatgrass-Cymopterus Plant Association
Festuca idahoensis-Agropyron spicatum-Cymopterus
terebinthinus foenicaulaceus (FEID-AGSP-CYTEF)



Fields Peak, Aldrich Mountains Plot 8806



Idaho fescue and bluebunch wheatgrass codominate subalpine gravelly sites with turpentine cymopterus in late to mid seral stands. Sampled sites were in the Aldrich and Wallowa Mountains. The type was found from 6,000-8,100 ft elevation (mean = 7,000 ft) on moderate to steep slopes (mean = 36%). All sampled sites were on southwest facing slopes where solar radiation and warmth were greatest. Sites were located on ridgetops and upper - mid slope positions on convex to flat surfaces. This type occurred on a broad range of substrates - basalts, dacite, sandstone, and serpentine. The two soils studied were droughty and formed in coarse-grained colluvium over bedrock. Very to extremely gravelly sandy loam was over bedrock at 21 and 39 inches in the two profiles. Available water capacity was very low (1.5 to 2 inches), and pH was 6.5 to 7.5.

In addition to the two principal bunchgrasses, Sandberg's bluegrass was often present. The perennial forbs associated with cymopterus were relatively few on these dry, warm sites. Only yarrow and sulfur penstemon were regular community members. Two dry, gravelly site plants (eriophyllum and scabland fleabane) were also found in these communities. Rock and gravel averaged 25% of the surface cover.

On steep colluvial slopes the cymopterus competes well with bunchgrasses by sending the taproot deep into the colluvium to reach available ground water. This plant association has not been previously described.

Table of Environmental Features
FEID-AGSP-CYTEF (n = 7)

	MEAN		RANGE	
Elevation (ft)	6,963		6,040-8,100	
Slope (%)	36		15-58	
Herbage (pounds/acre)	3,330			
Aspect (no. of plots)	NW 0	NE 0	SE 0	SW 7
Geology	Basalt, sandstone, serpentine, dacite			
Position	Ridgetop; upper and mid 1/3 slopes			
Relief	Convex, flat			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Grasses				
Idaho fescue	FEID	15	100	3-35
bluebunch wheatgrass	AGSP	16	100	5-25
Sandberg's bluegrass	POSA12	3	57	0-15
Forbs				
turpentine cymopterus	CYTEF	11	100	1-30
yarrow	ACMIL	5	100	1-20
yellow salsify	TRDU	1	43	0-1
red avens	GETR	1	43	0-5
scabland fleabane	ERBL	1	43	0-1
sulfur penstemon	PEAT3	5	71	0-15
eriophyllum	ERLA6	4	43	0-20
pussytoes	ANTEN	5	28	0-25

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	2	86	0-10
Rock	5	86	0-10
Gravel	20	86	0-55
Moss	8	43	0-25
Lichen	1	43	0-1
Litter	22	100	1-55

Idaho Fescue-Bluebunch Wheatgrass-Cusick's Frasera Plant Association

Festuca idahoensis-Agropyron spicatum-Frasera albicaulis
var. *cusickii* (FEID-AGSP-FRALC2)



Baldy Mountain Research Natural Area (proposed), Strawberry Mountains
Plot 8867



Distribution-Strawberry Mountains on serpentine substrates.

Environmental features - This plant association was found on peridotite, gabbro, and serpentine substrates on the north flank of the Strawberry Mountains. Elevational range was 6,360 to 7,420 ft (mean = 7,000 ft). Slopes were gentle to moderately steep (mean = 16%). Sampled sites were predominantly on northerly aspects. All surfaces were encountered (convex, concave, flat, and undulating). Sample sites were on ridgetops and at upper slope positions.

Vegetation composition - Bunchgrass cover was low owing to the low calcium and high metallic levels of the ultramafic rocks. Idaho fescue and bluebunch wheatgrass were the dominant species on these sites. Onespikes oatgrass was usually present as well. The forbs associated included plants often found on ultramafic sites (e.g., cockscomb cryptantha (*Cryptantha celosioides*) and Nuttall's draba (*Draba densifolia*)). Cusick's fraseria was always present as the most abundant forb. Sulphur penstemon (*Penstemon attenuatus* var. *palustris*), toothed balsamroot, and scabland fleabane were other species usually occurring with the bunchgrasses.

Successional relationships - Late seral stands are characterized as having Idaho fescue dominating over bluebunch wheatgrass at a 2:1 ratio. Mid seral stands contain the two principal bunchgrasses at a 1:1 ratio. Early seral stands are dominated by bluebunch wheatgrass.

Disturbance ecology - These subalpine sites were used intensively by domestic sheep in the early 1900s. Pedestalled fescue plants, erosion pavement in deflation depressions, and trailing terracettes are all indicative of past soil erosion resulting from overgrazing.

Relationship to other studies - This plant association has not been described previously.

Table of Environmental Features
FEID-AGSP-FRALC2 (n = 5)

	MEAN		RANGE			
Elevation (ft)	7,004		6,360-7,420			
Slope (%)	16		10-28			
Herbage (pounds/acre)	2,140					
Aspect (no. of plots)	NW 3	NE 1	SE 1	SW 0		
Geology	Peridotite, gabbro, serpentine					
Position	Ridgetop, upper 1/3 slope					
Relief	Convex, flat, concave, undulating					

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Grasses				
Idaho fescue	FEID	15	100	5-25
bluebunch wheatgrass	AGSP	10	100	1-20
onespike oatgrass	DAUN	1	80	0-3
Forbs				
yarrow	ACMIL	1	100	1-3
scabland fleabane	ERBL	3	80	0-3
stonecrops	SEDUM	4	40	0-10
sulfur penstemon	PEAT3P	3	100	1-5
spurred lupine	LULA3	4	40	0-5
Nuttall's draba	DRDE	2	80	0-3
Cusick's fraseria	FRALC2	7	100	3-15
toothed balsamroot	BASE2	1	80	0-1
woolly goldenweed	HALA3	1	40	0-1
cockscomb cryptantha	CRCE	1	40	0-1
prairie lupine	LULEU2	2	40	0-3

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	3	100	1-10
Rock	6	80	0-30
Gravel	44	100	0-55
Moss	4	40	0-20
Lichen	5	20	0-5
Litter	8	80	0-20

Idaho Fescue-Bluebunch Wheatgrass-Wheeler's Bluegrass Communities

***Festuca idahoensis-Agropyron spicatum-Poa nervosa wheeleri* (FEID-AGSP-PONEW) (n = 1)**

This Great Basin-based plant community was sampled on Fields Pack of the Aldrich Mountains. The microclimatic conditions necessary for Wheeler's bluegrass in association with Idaho fescue were afforded on a northeast aspect at 7,300 ft elevation. The community was located on a volcanic siltstone substrate of the Fields Creek Formation. The soil had a thin layer of volcanic ash mixed with colluvium, over colluvium and then bedrock. The available water capacity was moderate (4.5 inches) and pH 6.3 to 6.5. The profile consisted of gravelly silt loam 5 inches thick, over very to extremely gravelly loamy material down to bedrock at 52 inches. The site had been overgrazed historically by domestic sheep. Idaho fescue and bluebunch wheatgrass were low in coverage. Forbs were "weedily" high in cover (e.g., red avens, spurred lupine). Pocket gophers and slump topography (slope = 42%) were added causes of the early seral stage represented by the vegetation.

OTHER GRASSLAND COMMUNITIES

Oniongrass-Western Needlegrass

***Melica bulbosa-Stipa occidentalis* (MEBU-STOC) (n = 1)**

A ridgetop community at 7,300 ft elevation in the Strawberry Mountains, which has a history as a sheep livestock driveway, now contains a grass-dominated herbaceous component with perennial and annual forbs capitalizing on secondary site disturbance factors (e.g., pocket gophers). A very high composition of oniongrass (*Melica bulbosa*) at 20% cover and western needlegrass at 5% comprised the graminoid component. Perennial forbs present were thread-leaved fleabane and sulfur penstemon. The churning of the soil by pocket gophers left a gravel/bare ground surface of 70%. Populating this highly disturbed area were annual forbs (e.g., narrow-leaved collomia, spreading groundsmoke). The substrate was rhyolitic on Strawberry volcanics.

Western Needlegrass-Squirreltail

***Stipa occidentalis-Sitanion hystrix* (STOC-SIHY) (n = 3)**

Severe annual grazing by domestic livestock in subalpine environments have degenerated native plant communities, caused soils to erode extensively, and resulted in plant communities capable of inhabiting a drier, often warmer site, devoid of nutrient-rich soils. This community represents a vegetation found extensively along the subalpine mountain slopes where overgrazing and subsequent erosion has taken the vegetation beyond the threshold where Idaho fescue and elk sedge were

once prevalent on the site but can no longer persist. The "disclimax" vegetation resulting is usually capable of surviving on drier, depauperate sites. This community was found in the Strawberry Mountains and the Elkhorn Mountains of the central and southern Blue Mountains. Here two grasses, western needlegrass and bottlebrush squirreltail, codominated with 40% cover. An erosion pavement dominated the ground surface averaging 67%. Capitalizing on the lithic, warm site were phlox (especially *P. pulvinata*), western hawkweed, and hawksbeard. Elevations averaged 7,700 ft. Sampled sites were on moderate westerly slopes (mean = 13%). Substrates were basaltic in the Strawberry Mountains; granitic in the Elkhorn Mountains.

Sandberg's Bluegrass-Lance-leaved Stonecrop

***Poa secunda-Sedum lanceolatum* (POSA12-SELA) (n = 2)**

Ridgetops exposed to high winds following severe overgrazing by domestic sheep probably account for these communities. Representative sites were sampled at China Cap and High Hat Butte on the basaltic west flank of the Wallowa Mountains. Elevations ranged from 7,900 to 8,600 ft. The aspects were southwesterly on convex surfaces with slopes of 30%.

These sites were dominated by an erosion pavement, gravels, and rock (mean = 70%). Mosses and lichens were scarce (0 to 1%). Sandberg's bluegrass dominated the plant cover. Always associated were bottlebrush squirreltail, phlox, stonecrop, scabland fleabane, Columbia goldenweed, oval-leaved eriogonum, and yarrow. Sandberg's bluegrass plants were usually pedestalled. Erosive forces of wind, snow, ice, and melt water have created the erosion and its aftermath.

Rough Fescue-Idaho Fescue

***Festuca scabrella-Festuca idahoensis* (FESC-FEID) (n = 2)**

Rough fescue was found associated with Idaho fescue in the Wallowa Mountains. Rough fescue sites are intermediate in moisture requirements between the higher moisture-requiring green fescue and the more drought-tolerant Idaho fescue. Sampled sites occurred at 8,400 ft elevation on soils derived from Columbia River basalts. Aspects were both northerly and southerly. Slopes averaged between 25% and 30%. These communities are near ridgetops where the shoulder of the ridge provides the slope, moisture retention, and deeper soils required for rough fescue to persist. Idaho fescue was usually located on patch-like microsites where soils were drier within rough fescue stands. Rocks and gravels combined for a surface cover of 30% to 50% (unlike green fescue sites where rock-gravel percentages were usually 10% or less). Rocky site forbs were therefore prevalent, especially cushion phlox, taper-leaved penstemon, and prairie lupine.

ELK SEDGE COMMUNITIES



Echo Lake Divide, Seven Devils Mountains Plot 7084

Elk Sedge-Idaho Fescue

Carex geyeri-Festuca idahoensis (CAGE2-FEID) (n = 2)

These communities occur at lower subalpine elevations (mean = 7,185 ft) on moderately steep slopes (mean = 35%) in the Seven Devils Mountains. The single soil studied consisted of coarse-grained colluvium over metavolcanic bedrock, with low available water capacity (2.5 inches) and pH of 5.0 to 6.2. The profile consisted of very to extremely gravelly sandy loam over bedrock at 37 inches. These communities are located adjacent to subalpine fir, whitebark pine, and lodgepole pine forests on southwest aspects at mid and upper slope locations. Elk sedge dominates at a 3:1 ratio over Idaho fescue in mid seral stands. Late seral stands were not encountered. These communities have been subjected to overgrazing by domestic sheep in the past. Old terracettes were many but are now "smoothing" to the slope. Penstemons (globe) and asters (leafy, thick-stemmed, and few-flowered) form patches where disturbance has been extremely harsh to the sod plants. On eroded sites, western needlegrass and pussytoes colonize the gravel pavement. Tailcup lupine demonstrated increases with disturbance to the sedge-grass mat. The sampled sites were located on greenstone and basaltic substrates.

Elk Sedge-Parry's Rush

Carex geyeri-Juncus parryi (CAGE2-JUPA) (n = 1)

This community occupies convex "balds" in the subalpine of the Wallowa Mountains where sites were too dry and too lithic for green fescue to occur. The plot representing this community was sampled at 6,800 ft elevation on granodioritic substrates. Rock and gravels constituted 60% of the surface cover. Aspect was southeasterly; slope was 35%. The soil was shallow and droughty, consisting of extremely bouldery sandy loam over bedrock at 21 inches depth. Available water capacity was very low (about 1 inch) and pH 6.4 to 6.5. Elk sedge and Parry's rush codominated. The rush occupied the deflation depressions. Other hot, dry site plants prominent in this community were prickly sandwort, golden buckwheat, and lace lipfern (*Cheilanthes gracillima*).

Elk Sedge-Pinegrass

Carex geyeri-Calamagrostis rubescens (CAGE2-CARU) (n = 1)

These communities occurred in interforest subalpine clearings on deep soils near the ecotone with forested communities. The plot representing this community was sampled at 7,000 ft elevation in the Seven Devils Mountains. Dominating these sites were the two principal graminoids (elk sedge and pinegrass). Another prominent grass of the community was western needlegrass. Two forbs were "weedily" present in patches. These were thick-stemmed aster and sticky cinquefoil.

Elk Sedge-Cusick's Bluegrass

Carex geyeri-Poa cusickii (CAGE2-POCU3) (n = 1)

This community, dominated by graminoids, was found in the Greenhorn Mountains on greenstone substrates. It was on sites where soil depth is insufficient for sagebrush establishment. Here, at 8,000 ft elevation, on gentle ridgetop locations, elk sedge was found in a 2:1 ratio with Cusick's bluegrass. Forbs usually associated on lithic surfaces were abundant (e.g., prickly sandwort, cushion phlox). On nonlithic, deeper soil microsites, tailcup lupine and pale agoseris were weedily present. This ridgetop had been historically grazed severely by domestic sheep. Today disturbance is provided by pocket gophers, which create the opportunity for invasion by "weedy" forbs (e.g., penstemon, agoseris, lupine).

Elk Sedge-Desert Phlox

Carex geyeri-Phlox austromontana (CAGE2-PHAU3) (n = 1)

The elk sedge-desert phlox community is found in the Elkhorn Mountains on convex slopes and granodiorite outcroppings. The ground surface is gravelly and highly adapted for phlox. The plot representing this community was on a 45% slope, southwest aspect, and at upper slope positions at 7,500 ft in elevation. Elk sedge formed mats with phlox and cymopterus occupying the gravels surrounding the graminoids. These sites have been heavily used by domestic sheep historically and currently by elk and mountain goats. Other principal forbs in the community were western hawkweed, tailcup lupine, and woolly goldenweed.

Elk Sedge-Western Needlegrass

Carex geyeri-Stipa occidentalis (CAGE2-STOC) (n = 1)

This community occurred on Silver Butte of the Blue Mountains at 6,200 ft elevation. It occupied a site with a peridotite - diorite substrate. Elk sedge formed a mat and dominated. Western needlegrass, mountain brome, mountain oatgrass, and Hood's sedge were other prominent graminoids. The grass-sedge sod was dense making the forb component minor relative to the graminoid cover. Principal forbs were hot rock penstemon, blueleaf strawberry, and yarrow. The aspect was southeasterly, on a 20% slope, with undulating microtopography.

OTHER SEDGE COMMUNITIES

Alpine Sedges-Western Needlegrass

Carex spp.-Stipa occidentalis (CAREX-STOC) (n = 1)

This community occurred in the Greenhorn Mountains on sites devoid of graminoids owing to severe overgrazing by domestic sheep in the late 1800s to early 1900s. Surrounding this vegetation was a subalpine ridgetop at 7,200 ft of western coneflower and tarweed with other annual forbs. Although lush (800 pounds/acre) and with high coverage by graminoids (80% cover), elk and other wild ungulates were making little use of these species. The principal sedges were Ross' sedge, thick-headed sedge, and Raynold's sedge. Western needlegrass, prickly sandwort, and pale agoseris rounded out the community.

Hood's Sedge - Mountain Brome Meadows

Carex hoodii-Bromus carinatus (CAHO5-BRCA5 Meadow)

These meadows were severely disturbed by domestic overgrazing by sheep in the late 1800s and early 1900s. Mountain brome, bearded wheatgrass, and green fescue once were more abundant in these subalpine meadows of the Wallowa Mountains. Sampled sites occurred on gentle to moderate toe slopes and canyon bottoms. Substrates were basaltic or on limestone-derived soils. Elevations ranged from 6,400 to 7,500 ft. Surfaces were convex or flat. The single soil studied was formed in volcanic ash over residuum. It had a moderate available water capacity (7.5 inches) and pH of 5.8 to 6.7. The profile consisted of loam 8 inches thick over stony fine sandy loam and clay loam, with bedrock at 55 inches.

Hood's sedge has aggressively invaded and dominates these meadows. Mountain brome and western needlegrass are strong associates. Green fescue is relict or absent. Lush forbs may dominate on early seral sites (e.g., alpine fleecflower, licoriceroot, horsemint, penstemon, stickseed, and asters).

**Table of Environmental Features
CAHO5-BRCA5 (n = 4)**

	MEAN		RANGE	
Elevation (ft)	6,875		6,430-7,510	
Slope (%)	18		10-30	
Herbage (pounds/acre)	2,220			
Aspect (no. of plots)	NW 0	NE 0	SE 1	SW 3
Geology	Basalt, limestone			
Position	Toeslope, canyon bottom			
Relief	Convex, flat			

Table of Principal Species

SPECIES	CODE	COVER (%)	CONSTANCY (%)	RANGE
Grasses				
mountain brome	BRCA5	6	100	1-20
western needlegrass	STOC	6	100	1-20
Sedges				
Hood's sedge	CAHO5	49	100	25-85
Raynold's sedge	CARA6	20	5	0-20
Forbs				
yarrow	ACMIL	2	75	0-3
alpine fleecflower	POPH	6	25	0-25
thick-stemmed aster	ASIN3	3	75	0-10
blue stickseed	HAJE	4	75	0-15
globe penstemon	PEGL5	5	75	0-15
Canby's licoriceroot	LICA2	5	25	0-20
nettleleaf horsemint	AGUR	3	25	0-10

Table of Ground Surface Features

	COVER (%)	CONSTANCY (%)	RANGE
Bareground	8	100	5-15
Rock	1	50	0-1
Gravel	1	50	0-1
Moss	0	0	0
Lichen	0	0	0
Litter	21	100	5-50

OTHER HERBACEOUS COMMUNITIES

Parry's Rush-Pale Agoseris
***Juncus parryi*-*Agoseris glauca* (JUPA-AGGL) (n = 2)**

These are communities derived from severe overgrazing by domestic sheep in the Greenhorn Mountains. Representative sites were sampled at Sunrise Butte and Boulder Butte. Elevations ranged from 7,300 to 7,700 ft. Aspects were southwesterly. Substrates were granitic. Slopes were gentle to moderate at ridgetop locations. Two soils were studied with rather different properties. One formed in residuum over bedrock, had low available water capacity (2.5 inches), pH of 5.5, and consisted of very gravelly and stony sandy loam over bedrock at 30 inches deep. The other soil had a volcanic ash mantle over residuum and bedrock, had a moderate available water capacity (4.5 inches), pH of 6.1 to 6.3, and consisted of gravelly silt loam to 19 inches deep, over very gravelly and stony sandy loam, over bedrock at 36 inches.

Parry's rush dominated (mean = 53%) with two forbs strongly associated - pale agoseris and cushion phlox. Prickly sandwort, western needlegrass, and rosy pussytoes were also common members of these communities. Parry's rush occupied relict soil, whereas phlox, prickly sandwort, agoseris, and pussytoes occupied the erosion pavement of the interstitial area. Bare ground averaged a high 10% on the ground surface.

Pygmy Lewisia-Tarweed
***Lewisia pygmaea*-*Madia glomerata* (LEPY2-MAGL2) (n = 1)**

This community is found over a large extension of Jim White and Mud Springs Ridges where some of the most severe overgrazing by domestic sheep caused a major reclamation project in 1962 known as the Flagstaff Project. Aggressive terracing and reseeding of high-elevation rangelands were the practices performed by project workers. Today these sites still have a low vegetative cover and a high percentage of bare ground and gravel (up to 50%). The soils are deep and once contained green fescue plant associations. Today they are disclimactic with annuals dominating.

The representative site is at 6,800 ft elevation, on a southwest aspect, and on a gentle, flat to convex slope. These sites are all on Miocene basalts of the Yakima Formation. Dominating the plant cover were cluster tarweed, large-flowered agoseris, red sandspurry, and pygmy lewisia. The only grasses associated were slender hairgrass and western needlegrass.

Western Coneflower-Cluster Tarweed
***Rudbeckia occidentalis-Madia glomerata* (RUOC2-MAGL2)**
(n = 2)

Extreme overgrazing of subalpine grasslands by domestic livestock (sheep in the early 1900s; cattle in mid to late 1900s) has resulted in disclimax vegetation where perennial grasses are relict or absent altogether. Deep soils are now providing forb fields with high annual populations. The sites sampled had surface cover by bare ground and gravels from 50% to 85%!

The representative sites were on subalpine ridgetops and upper slopes in the Greenhorn Mountains and on the west flank of the Wallowa Mountains. Gone are the fescues that once dominated these grassland sites. Replacing them are western coneflower-dominated forblands. Sedges and grasses are relict. The bare ground is populated by annuals (e.g., cluster tarweed, narrow-leaved collomia, twinleaf bedstraw).



Plant Indicator Species Descriptions

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Plant Indicator Species

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Grand Fir

Abies grandis

Family - Pinaceae

ABGR

Range: Vancouver Island, British Columbia south to Bay Area of California on west side of Cascades; southeastern British Columbia in Rocky Mountains to northcentral Idaho, western Montana; southeastern Washington and northeastern Oregon in the Blue and Wallowa Mountains.

Habitat: Principal montane coniferous forest. On moist mountain slopes; on northerly and easterly slopes at lower limits; and on all aspects at upper limits. Environmentally oriented moister and cooler than climax ponderosa pine and Douglas-fir sites; warmer than climax subalpine fir sites.

Look Alikes: Easily confused with white fir (*Abies concolor*). Differentiate by stomatal bands (white fir has full stomatal band on top of leaf) and leaf length (white fir leaves longer than 1.5 inches). Hybridization between these two true firs in eastern Oregon and west central Idaho make identification difficult. Subalpine fir (*A. lasiocarpa*) - stomatal band along top of leaf; leaves upturned and spirally arranged. Resin ducts midway between leaf margin and midvein.

Indicator Value: Type indicator for grand fir plant associations. The most mesic species of the intermountain coniferous trees. Representative of warm to cool (but not cold), moist (but not wet) environments. Sites are very productive in species richness and biomass.

Miscellany: Wood used for lumber and pulp. Fir stands are invaluable to wildlife. Provides excellent thermal and hiding cover, snags for cavity nesters, hollow logs for dens, and browse in winter to help sustain deer and elk. Commercially grown for Christmas trees. Moderately susceptible to mortality from fire (dependent on stand structure and site). Fire in drier grand fir plant associations may underburn with less tree mortality; in moister grand fir plant associations fire results in stand replacement burns. Indian paint fungus is the primary wood rotting disease for grand fir; spruce budworm and tussock moth reduces stocking on dry sites and where tree stocking levels are too high. Nez Perce used resin for tea against whooping cough and to make an ointment for colds. Boiled needles were used for eyewash; dried and pulverized as a baby powder.



Grand Fir

Abies grandis

ABGR

Habit: Coniferous tree up to 250 feet tall; narrow, open crown usually rounded.

Big Tree: National Champion - Redwood National Park, Washington (Ht. - 257', Circum. - 245", Spread - 36', Points - 511).

Oregon Champion - Umatilla NF (Ht. - 194', Circum. - 224", Spread - 40', Points - 428).

Idaho Champion - Clearwater NF (Ht. - 181', Circum. - 220", Spread - 44', Points - 412).

Wallowa-Whitman Champion - Pine RD (Ht. - 146', Circum. - 232", Spread - 30', Points - 386).

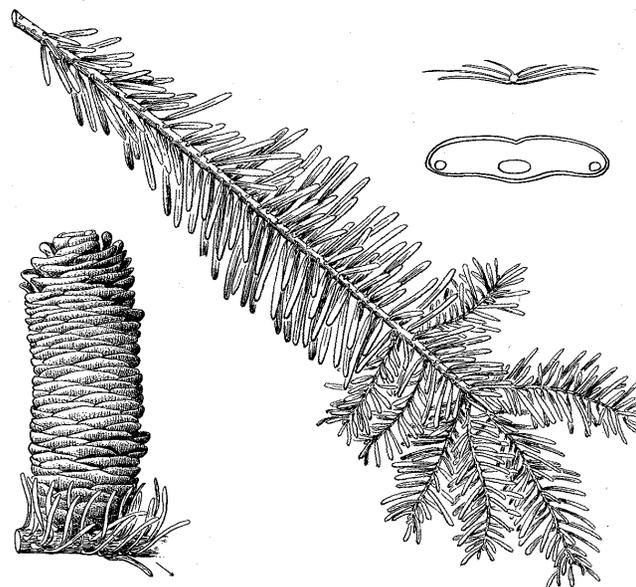
Umatilla Champion - "The Oregon Champion," Umatilla NF (Ht. - 194', Circum. - 224", Spread - 40', Points - 428).

Bark: Smooth, grey to light brown with resin blisters at early age, ashy brown with 2-3 inches thick furrowed bark in older trees; inner bark dark purplish-red.

Buds: Rounded, 3 at apex of stem, yellow brown.

Leaves: Needles 1-1.5 inches long; notched at apex; dark green; stomatal bands on lower leaf surface with no band on top, or a short stomatal blotch near the tip on leaf top; two-ranked in flat sprays; resin ducts located near the leaf margin.

Fruit: Cones. Staminate cones yellowish; ovulate cones yellow-green to green, 2-4 inches long; cylindrical; upright on branch; bracts shorter than scales; cones disintegrate on the tree (Flowers: May - June; sheds seeds: early September).



Subalpine Fir

Abies lasiocarpa

Family - Pinaceae

ABLA

Range: Alaska and the Yukon to Alberta, British Columbia; south in Cascades to the Siskiyou in Oregon; south to Blue and Wallowa Mountains of eastern Oregon; mountains of north and central Idaho, western Montana, Wyoming, Colorado, New Mexico and Arizona.

Habitat: Subalpine slopes, ridges (usually between 5000 and 8000 feet). Found at lower elevations along streamcourses due to cold air flow. With elevational increases the species occupies northerly and easterly aspects. Occupies all aspects at timberline. Environmentally oriented on cooler sites than climax grand fir, Douglas-fir and ponderosa pine.

Look Alikes: Engelmann spruce (*Picea engelmannii*) - sharp pointed leaves; cones fall intact. Grand fir (*Abies grandis*) needles two-ranked; lacks full stomatal band on leaf top. Douglas-fir (*Pseudotsuga menziesii*) - sharp, pointed reddish buds; cones fall intact. White fir (*Abies concolor*) - needles 1.5-2.5 inches long; resin ducts near leaf margin.

Indicator Value: Type indicator for subalpine fir plant associations. Highly present in cold, moist environments where mountain hemlock, Engelmann spruce and lodgepole pine occur.

Miscellany: The most widely distributed fir in North America. Wood used for lumber; makes excellent pulp. Subalpine fir stands important to wildlife as summer range for mule deer, elk, bear. Forests used for squirrels, mice, chipmunks, and lynx. Birds using subalpine fir trees are woodpeckers, nuthatches, juncos, chickadees, crossbills, siskins, grouse and owls. Blue grouse use subalpine fir stands year round and heavily feed on needles and buds. Native Americans made a hair tonic using needles made into powder with grease from deer; placed finely ground needle powder on open cuts; scent from boughs as air fresheners. Nez Perce warded off bad spirits placing boughs in their lodges; burned fir to rid bad spirits, and to fumigate a lodge after death of the occupant. Western spruce budworm, tussock moth, wood rots and fire are damaging agents. Very susceptible to fire. Low intensity fire kills the trees due to thin, resin-filled bark, shallow roots and dense lower branches.



Subalpine Fir

Abies lasiocarpa

ABLA

Habit: Coniferous tree up to 100 feet tall; with a spirelike crown; upper branches short, stiff; lower branches usually drooping. Near timberline tree is greatly dwarfed into shrubby form by environmental elements (cold temperatures, severe winds, snow and ice shearing).

Big Tree: National Champion - Olympic Nat'l Park, Wash. (Ht. - 125', Circum. - 252", Spread - 26', Points - 384).

Oregon Champion - Umatilla NF, Oregon (Ht. - 121', Circum. - 151", Spread - 29', Points - 279).

Idaho Champion - Clearwater NF (Ht. - 137', Circum. - 157", Spread - 5', Points - 299).

Wallowa-Whitman NF Champion - Pine RD (Ht. - 121', Circum. - 120", Spread - 33', Points - 249).

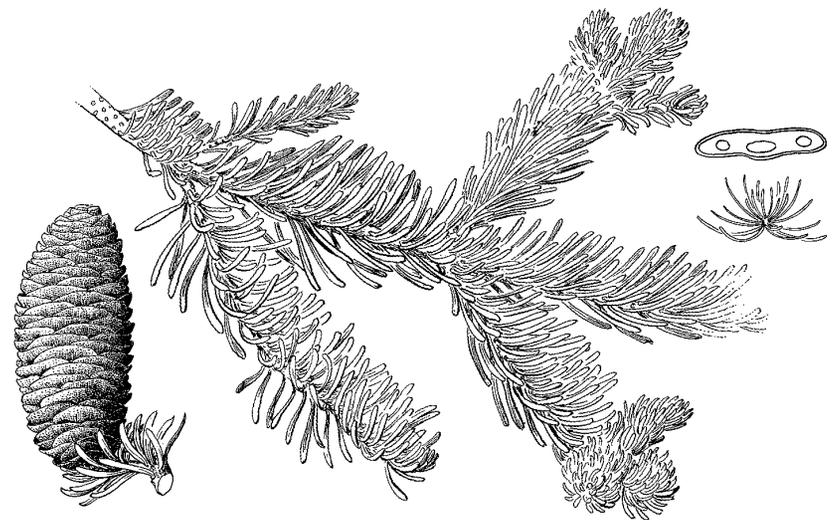
Umatilla NF Champion - "The Oregon Champion," Umatilla NF, Oregon (Ht. - 121', Circum. - 151", Spread - 29', Points - 279).

Bark: Thin, ash-gray, smooth with resin blisters; on older trees bark is fissured at the base.

Buds: Rounded, 3 at apex of stem, light brown.

Leaves: Needles 1-1.5 inches long; bluish-green; rounded tips, stomatal bands on both surfaces; leaves turning upward from spiral arrangement on the twig. Resin ducts located midway between leaf margin and midvein.

Fruit: Cones. Staminate cones bluish up to 10mm long; ovulate cones deep purple, 2-4 inches long, cylindrical, upright on the branch; bracts shorter than scales. Cones disintegrate on tree (Flowers: June - early July; sheds seeds: September).



Western Juniper

Juniperus occidentalis

Family - Cupressaceae

JUOC

Range: Southeastern Washington, eastern Oregon southward in the Sierra Nevada Mountains of California. Also in extreme southwestern Idaho and northwestern Nevada.

Habitat: Dry sites at the lower limits of tree growth. Prefers moist, seepy canyon sites but has spread due to fire exclusion and overgrazing into dry, sandy and gravelly sites where sagebrush shrublands and grasslands are climax. Occupies the environmental zone between non-forest sustaining lands and the principal coniferous tree growing sites of the mountains.

Look Alikes: Other junipers with scale-like leaves. Rocky Mountain juniper (*J. scopulorum*) has needles 2-ranked, not glandular with resin droplets. Common juniper (*J. communis*) has needle or awl-shaped leaves; spreading - usually under 5 feet tall.

Indicator Value: The most xeric tree-growing environment in the Inland Pacific Northwest. Type indicator for western juniper plant associations. Also found due to fire exclusion and as an accidental in Douglas-fir and ponderosa pine/snowberry communities; ponderosa pine/mountain-mahogany, ponderosa pine/bitterbrush and ponderosa pine/sagebrush communities. In subalpine of Strawberry Mountains on serpentine (PSME-PIPO-JUOC/FEID).

Miscellany: Valued for fence posts and planters due to durability and resistance to rot; firewood. Used for novelty products, clocks, signs, for its coloration; boughs used for Christmas decoration due to contrast in color with evergreen foliage. Berries are important for mammals (coyote, chipmunk, ground squirrel, mice) and birds (grosbeaks, jays, robins). Mule deer and antelope use junipers for food and cover. Bluebirds and chickadees cavity nest in them. Used as ornamental for landscaping. Oils used for flavoring or scenting agents in beverages, seasonings, soaps, cosmetics. Berries are edible (use dried). Readily killed by fire (especially thin-barked young trees). Does not sprout.



Western Juniper

Juniperus occidentalis

JUOC

Habit: Rounded, small coniferous tree up to 30 feet tall, or bushy shrubs up to 20 feet tall. Branches usually extend to the ground.

Big Tree: National Champion - Stanislaus NF, Calif. (Ht. - 86', Circum. - 480", Spread - 58', Points - 581).

Oregon Champion - Lake County (Ht. - 78', Circum. - 232", Spread - 39', Points - 320).

Idaho Champion - Owyhee County (Ht. - 57', Circum. - 205", Spread - 46', Points - 273).

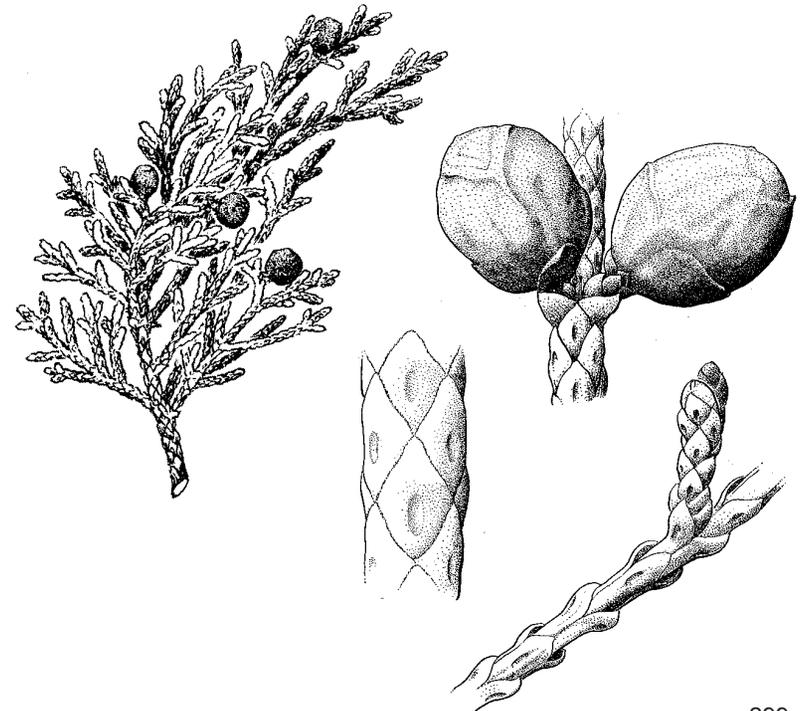
Wallowa-Whitman NF Champion - Baker RD (Ht. - 50', Circum. - 120", Spread - 38', Points - 180).

Umatilla NF Champion - Heppner RD (Ht. - 63', Circum. - 191", Spread - 40', Points - 264).

Bark: Stringy and furrowed, thin; grayish-brown with reddish-brown inner bark.

Leaves: Scale-like, opposite or in 3's acute, 1/8 inch long; gray-green with a prominent gland on upper leaf surface usually with a resin droplet.

Fruit: Cones. Ovulate cones bluish-black, round, 1/4 inch, covered with glaucous bloom (Flowers: May - June).



Rocky Mountain Juniper

Juniperus scopulorum

JUSC2

Family - Cupressaceae

Range: Southern British Columbia and Southwestern Alberta; Montana to western Dakota; eastern Washington; northeast Oregon; Idaho and south to Nevada, Utah, Arizona, New Mexico; Colorado; Wyoming, and western Nebraska.

Habitat: On limestone in the subalpine of the Wallowa Mountains. Generally at lower montane elevations, in valleys, and on dry, sand or gravelly soils in plains.

Look Alikes: Other junipers with scale like leaves found in northeast Oregon. Rocky Mountain juniper has 2-ranked needles, non-glandular. Western juniper (*J. occidentalis*) leaves are ranked in 3's and contain a gland on upper leaf surface (usually with a resin droplet). Common juniper (*J. communis*) has needle or and shaped leaves and is usually under 5 feet tall (spreading).

Indicator Value: Often associated with curleaf mountain-mahogany on Martin Bridge, limestone formations at higher montane elevations (up to 6500 feet). Defines the singular Rocky Mountain juniper type of the Wallowa Mountains (JUSC2/CELE3).

Miscellany: Valued for durability of its wood. Seeds of cones important for chipmunks, ground squirrels, mice, and songbirds. Prime cover for mule deer. Bighorn sheep feed on juniper cones. Used by Native Americans to provide relief from colds (smoke inhaled from burning needles), as an incense in ceremonies, and was considered sacred since trees never seemed to grow old and they remained green year-round. Nez Perce made teas from branches and cones which they used for common colds, fevers, and pneumonia.



300

Rocky Mountain Juniper

Juniperus scopulorum

JUSC2

Habit: Bushy shrubs to small trees up to 45 feet tall with irregular, rounded crowns.

Big Tree: National Champion - Cache National Forest (Utah) (Ht. - 40'; Circum. - 247", Spread - 21', Points - 292).

Oregon Champion - None listed.

Idaho Champion - Franklin County (Ht. - 26'; Circum. - 160", Spread - 24', Points - 192).

Wallowa-Whitman NF Champion - None listed.

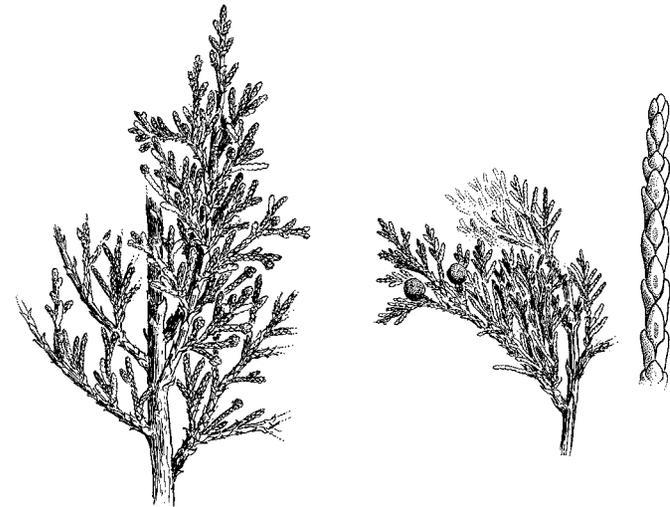
Umatilla NF Champion - None listed.

Stems and Bark: Twigs are square in cross section (4-angled); bark is thin, furrowed, and shredding. Outer bark is grayish; inner bark is reddish-brown.

Leaves: Scale-like, in alternative pairs (2-ranked), oppressed to the twig; about 1/8 inch long, acute to oval-shaped, obscurely glandular (no resin droplets); yellow-green to green in color.

Flowers: Dioecious (staminate and pistillate flowers on separate junipers).

Fruit: Glauous (greyish bloom) on round cone (bluish-purple); 1/4-1/3 inch in diameter. Seed: 1-2 per cone, triangular and grooved; cones mature in second year.



301

Western Larch

Larix occidentalis

Family - Pinaceae

Range: Southern British Columbia south on east side of Cascades to central Oregon; across northern Washington to northeast Montana, northern Idaho and in southeast Washington and northwest Oregon.

Habitat: A mid montane species growing on moist, deep soils as well as dryer gravels. Found in north and east exposures at lower limits of its environmental range (i.e., moist, cool Douglas-fir plant associations); on all exposures in the moist mid and upper elevational range. Especially prominent on ash influenced soils.

Look Alikes: Very distinctive. Might be mistaken for ponderosa pine looking at the bark only. But on closer inspection the needles and cones are very different from that of pine. Pine - needles in fascicles of 2, 3, or 5; cones without bracts. Larch - 15 to 30 tufted on a spur; cones with bracts.

Indicator Value: A fire seral species in Douglas-fir, grand fir and subalpine fir plant associations. Degree of dominance by larch in fir communities is indicative of past fire history and frequency. In subalpine, larch is prominent in subalpine fir (ABLA2/VAME, ABLA2/CARU, ABLA2/VASC) and grand fir (ABGR/VAME, ABGR/CARU) plant associations.

Miscellany: Valuable, due to strength of wood, for construction lumber, utility poles, plywood and veneer, shakes and firewood. Larch forests provide habitat for elk, deer and bear. Blue grouse and spruce grouse use the needles. Crossbills eat the seeds. Native Americans made a sweet syrup and chewed gum from the resin. Nez Perce drank tea from the bark for colds, coughs and sore throats. Bowls were fashioned by Nez Perce. The most fire resistant tree in the Inland Pacific Northwest (bark may be 6 inches thick at ground surface). Trees quickly establish after fire, grow rapidly and dominate as fire pioneers.



LAOC

Western Larch

Larix occidentalis

LAOC

Habit: A large coniferous tree 140-180 feet tall; a long, clear bole with a short crown of horizontal, radiating branches.

Big Tree: National Champion - Wenatchee NF (Ht. - 189', Circum. - 230", Spread - 35', Points - 428).

Oregon Champion - Wallowa-Whitman NF (Ht. - 103', Circum. - 269", Spread - 30', Points - 380).

Idaho Champion - Latah County (Ht. - 142', Circum. - 239", Spread - 22', Points - 387).

Wallowa-Whitman NF Champion "The Oregon Champion," (Ht. - 103', Circum. - 269", Spread - 30', Points - 380).

Umatilla NF Champion - Heppner RD (Ht. - 177', Circum. - 212", Spread - 25', Points - 396).

Bark: Thin, scaly grayish-brown on young trees; thick (3-6 inches) flattened plates between deep furrows on older trees. Yellowish brown older bark resembles ponderosa pine bark.

Buds: Rounded, 1/8 inch; chestnut brown.

Leaves: Our only conifer with deciduous needles, 15-30 bunched in a spur; pale green; 1-2 inches long. Turn brilliant yellow in autumn before falling.

Fruit: Cones. Staminate cones yellow, 1/2 inch long; ovulate cones are oblong, 1 inch long; scales reddish-brown; reflexed scales; bracts with prominent central spine are longer than the scales (Flowers: May - June; sheds seeds: September - October).



Engelmann Spruce

Picea engelmannii

Family - Pinaceae

Range: Yukon to British Columbia, Cascades of Washington and Oregon to northern California; east to Alberta and south in Rocky Mountains to New Mexico and Arizona. Rarely west of Cascades in Oregon and Washington.

Habitat: Cold, moist sites (especially wet frost pockets); in forests often dominated by true firs. Best development on well drained soils. Prominent at margins of meadows, streams, lakes. Extends to lower elevations along streams with cold air flow. At mid elevations pure stands occur on alluvial terraces, wet benches, bottom land, seepy slopes or north aspects. At timberline spruce is found on all aspects.

Look Alikes: Easily differentiated from true firs (*Abies grandis*, *A. lasiocarpa*) and Douglas-fir (*Pseudotsuga menziesii*) by sharp, stiff needles (pricking to the touch). Cones are distinctive from other Inland Pacific Northwest conifers in having papery thin scales and light coloration.

Indicator Value: Consistent associate with subalpine fir plant associations; found prominently in cooler, moister grand fir plant associations (ABGR/VAME, ABGR/CARU) at subalpine elevations. Long lived seral species.

Miscellany: Wood used for lumber, pulp, plywood. Once widely used in aircraft manufacture due to lightweight, straight grain and easy-to-work properties. Provides excellent hiding and thermal cover for bear, elk, deer. Trees used by chickadees, nuthatches, owls and woodpeckers. Spruce

grouse and blue grouse feed extensively on buds and needles. Squirrels clip buds and juvenile shoots. Seeds eaten by squirrels, chipmunks, mice, voles, chickadees, nuthatches, crossbills, and siskins. Used as ornamental landscaping tree. Native Americans used bark for canoes, baskets; roots used for rope; needles used for incense and teas. Root rots, spruce bark beetle and fire are principal agents of mortality. Very sensitive to fire. Killed by low intensity burns due to shallow roots and thin resin-filled bark.



Photo by Karl Urban

Engelmann Spruce

Picea engelmannii

PIEN

Habit: Coniferous tree up to 180 feet tall; crown narrow and pyramidal; branches whorled and extending to the ground on open-growing trees.

Big Tree: National Champion - Olympic National Park, Washington (Ht. - 179', Circum. - 283", Spread - 27', Points - 469).

Oregon Champion - Umatilla NF (Ht. - 190', Circum. - 212", Spread - 28', Points - 409).

Idaho Champion - None listed.

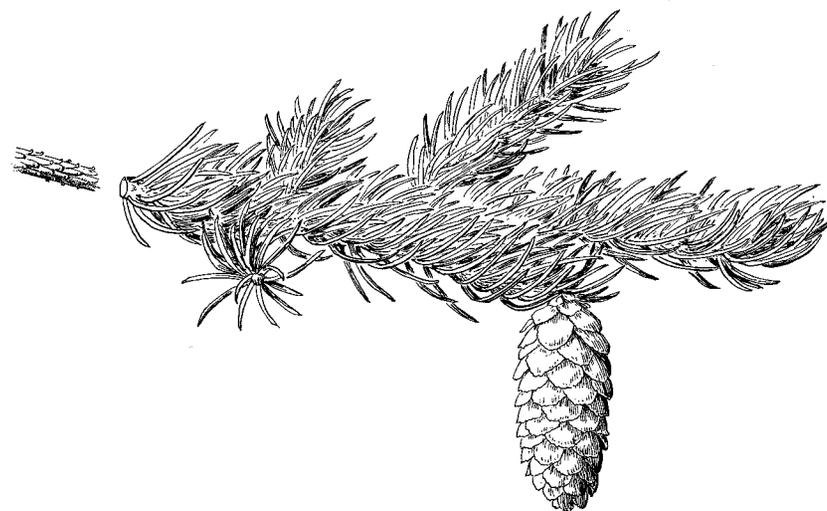
Wallowa-Whitman NF Champion - Pine RD (Ht. - 150', Circum. - 190", Spread - 34', Points - 349).

Umatilla NF Champion - Pomeroy RD (Ht. - 207', Circum. - 147", Spread - 36', Points - 363).

Bark: Thin, loose, scaly; reddish to purplish brown.

Leaves: Needles; rigid, 1-2 inches long, sharply pointed, bluish-green; whorled on the twig; 4-angled; 2 stomatal bands on top and bottom; small knobs remain on the twig when needle is shed.

Fruit: Cones. Staminate cones are yellow, 10-15mm long; ovulate cones are oblong, 1-2 inches long, light chestnut brown with thin, papery scales; scale margin serrated; blunt bract only 1/3 length of scale; hang pendulous on branches (Flowers: June - July; sheds seeds: September - October).



Whitebark Pine

Pinus albicaulis

Family - Pinaceae

Range: Southern British Columbia south in Cascades to Sierra Nevada of California; eastward to southwest Alberta, western Montana, eastern Oregon, eastern Washington, northwest Wyoming, Idaho to northern Nevada.

Habitat: Above 6,000 feet in the Inland Pacific Northwest on dry, rocky exposures high in the mountains. It forms stunted shrub-like thickets with subalpine fir at timberline. Pioneers after burns on exposed mineral soils via dispersal by Clark's nutcrackers.

Look Alikes: Other 5-needled pines. Limber pine (*P. flexilis*) is high elevation 5-needled pine also. Limber pine cones drop to ground intact and are larger (greater than 3 inches). White pine (*P. monticola*) has stalked, longer cones (over 5 inches) which drop intact to ground; fine, flexible blue-green needles. Only other high elevation pine is lodgepole (*P. contorta*) which has 2 needles per fascicle.

Indicator Value: The highest elevation tree species occupying the coldest environmental zone. Type indicator for whitebark pine and subalpine fir - whitebark pine plant associations. May be found as seral stage species in some subalpine fir (ABLA2/VASC, ABLA2/POPU, ABLA2/CAGE) plant associations.

Miscellany: Of little commercial value for timber products. Distribution and abundance of the species dependent on Clark's nutcracker for seed dispersal. Fire resistant due to its severe site and scattered nature (fire discriminates against subalpine firs give competitive advantage to the pine). Fire control lengthens intervals between sanitizing burns resulting in fire-prone stands due to increases in fir composition. Very susceptible to white pine blister rust and secondarily to mountain pine beetle after weakening by the rust. Besides Clark's nutcracker, woodpeckers, chickadees, nuthatches, finches, crossbills, grosbeaks and blue grouse use the seeds. Squirrels, chipmunks and bears use the caches. Blue grouse use needles and buds. Greatest value of the tree is for watershed protection.



Whitebark Pine

Pinus albicaulis

PIAL

Habit: Stunted to contorted subalpine conifer, only 15-50 feet tall. At timberline the trees may become prostrate from severe snow loading, wind and ice shearing.

Big Tree: National Champion - Sawtooth NRA, Idaho (Ht. - 69', Circum. - 331", Spread - 47', Points - 412).

Oregon Champion - Wallowa-Whitman NF (Ht. - 72', Circum. - 223", Spread - 62', Points - 311).

Idaho Champion - National Champion - Sawtooth NRA, Idaho (Ht. - 69', Circum. - 331", Spread - 47', Points - 412).

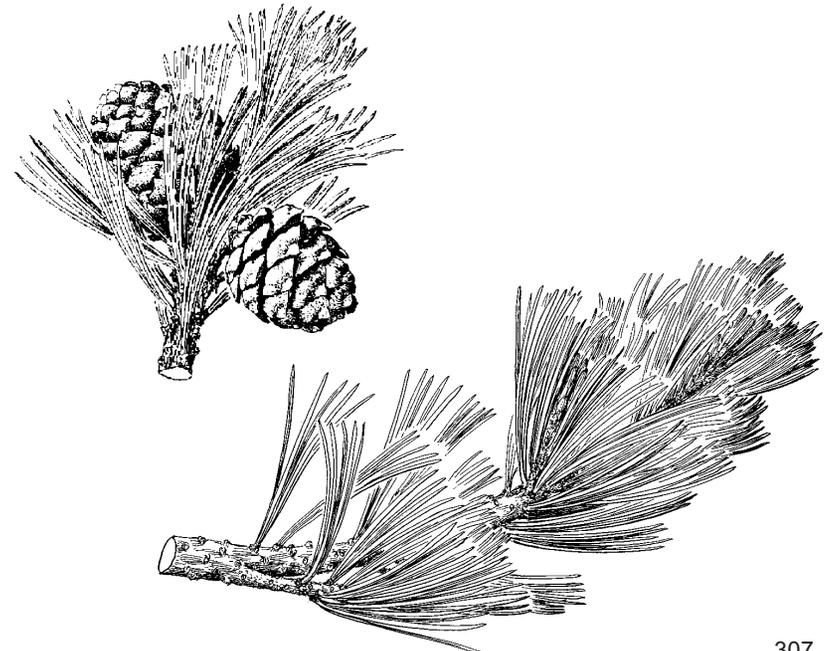
Wallowa-Whitman NF Champion - "The Oregon Champion," Wallowa-Whitman NF (Ht. - 72', Circum. - 223", Spread - 62', Points - 311).

Umatilla NF Champion - North Fork John Day RD (Ht. - 57', Circum. - 124", Spread - 33', Points - 189).

Bark: Thin, with whitish scales over a red-brown inner bark.

Leaves: Needles in fascicles of 5; stiff, 1-3 inches long; green to yellow-green; clustered at the ends of branches.

Fruit: Sessile cones. Staminate cones red; ovulate cones deep red to purple; ovoid, 2-4 inches long; thick scales with upturned point; cones tend to remain closed on tree and disintegrate rather than fall to ground intact (Flowers: June - July).



Lodgepole Pine

Pinus contorta (var. *latifolia*)

PICO

Family - Pinaceae

Range: Alaska and the Yukon southward to Alberta, Saskatchewan, through the Rocky Mountains to Colorado. Also in Blue and Wallowa Mountains of southeast Washington and northeast Oregon. Throughout much of Idaho, northern Utah and western Nevada.

Habitat: Mountain forests at mid to high elevations. An intolerant seral species. Forms extensive pure stands (following stand replacing burns). Grows across a wide environmental range from low elevation, warm-dry forests - i.e., PICO(ABGR)/CARU to high elevation, cold-moist forests - i.e., PICO(ABLA2)/VASC.

Look Alikes: Distinctive with its short needles in 2's and persistent cones. Other pines have 3 needles per fascicle (*P. ponderosa*) or 5 needles (*P. albicaulis*, *P. monticola*, *P. flexilis*).

Indicator Value: An early seral tree species in grand fir and subalpine fir plant associations. Pioneer species on burned-over sites aggressively forming even-aged stands (10-20 years after fire).

Miscellany: The conifer with greatest range of altitudes and latitudes in North America. Wood is valuable for small dimension lumber, plywood, posts and poles, and paper. Provide key summer range for deer and elk. Seeds used by squirrels, chipmunks; needles used by blue and spruce grouse. Native Americans used lodgepole pine poles for tipis; pitch, resin for chewing gum; inner cambium layer to counter tuberculosis. Due to thin

bark, regular ground fires kill many trees - but tend to thin the stands. Moderate to high intensity fires generally replace stands by crown burning. Key agents of mortality are mountain pine beetle, dwarf mistletoe, western gall rust, and fire.



Lodgepole Pine

Pinus contorta (var. *latifolia*)

PICO

Habit: Small coniferous tree up to 80 feet tall with a clear slender bole in dense stands; short crown at top.

Big Tree: National Champion - Valley County, Idaho (Ht. - 155', Circum. - 132", Spread - 32', Points - 295).

Oregon Champion - Umatilla NF, Oregon (Ht. - 110', Circum. - 128", Spread - 24', Points - 250).

Idaho Champion - National Champion - Valley County, Idaho (Ht. - 155', Circum. - 132", Spread - 32', Points - 295).

Wallowa-Whitman NF Champion - Unity RD (Ht. - 119', Circum. - 109", Spread - 8', Points - 236). Pine RD (Ht. - 112', Circum. - 117", Spread - 7', Points - 236).

Umatilla NF Champion - Umatilla NF, Oregon (Ht. - 110', Circum. - 128", Spread - 24', Points - 250).

Bark: Thin, scaly, gray to dark gray, less than 1 inch thick.

Buds: Ovoid, 1/4 inch; chestnut-brown, resinous.

Leaves: Needles in fascicles of two, 1-3 inches long; stiff - often twisted; green to yellow green.

Fruit: Cones. Staminate cones reddish green, clustered, 8-10mm long. Ovulate cones sessile, 1-2 inches long, ovoid, some opening after second year - others remaining closed and persisting many years on tree; purplish-brown; basal scales knoblike; armed with long prickle (Flowers: April - June; sheds seeds: September - October).



Limber Pine

Pinus flexilis

Family - Pinaceae

PIFL2

Range: Southeast British Columbia and Southwest Alberta. Northeast Oregon (limited to the northern Wallowa Mountains); southward through the Rocky Mountains to New Mexico; Sierras in central and southern California; the Great Basin ridges of Nevada and Utah to Colorado, Wyoming, and Montana.

Habitat: Exposed ridges, slopes, and rocky outcrops. Restricted to limestone and marble substrates of the Martin Bridge Formation from 6000 to 8000 foot elevations. Dispersed by Clark's nutcrackers, squirrels, and chipmunks.

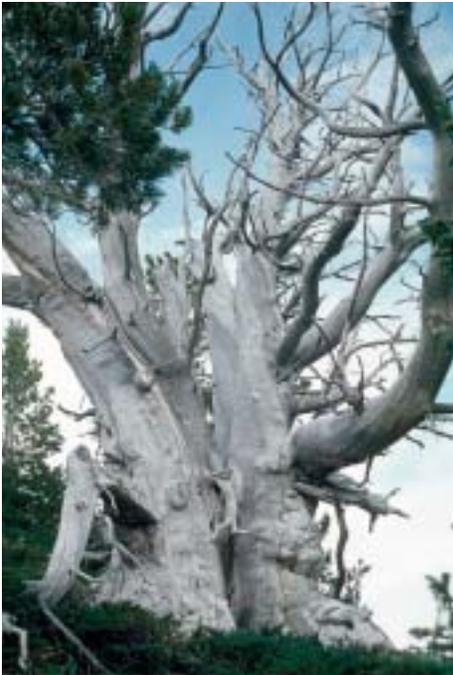
Look Alikes: Other five-needle pines. Whitebark pine (*P. albicaulis*) cones fall from the tree unopened at maturity. Limber pine cones open on the tree and fall intact to the ground.

Cones of whitebark pine are deep red to purple in color; cones of limber pine are brown. The cones of western white pine (*P. monticola*) are stalked longer (over 5 inches). Lodgepole pine (*P. contorta*) is the only other pine in the subalpine. It has 2 needles per fascicle whereas the other pines are 5-needled.

Indicator Value: Joins whitebark pine as an occupant of cold, dry, harsh subalpine environments. Type indicator for PIFC2/JUCOM2 plant community type. Occurs on limestone with limber pine as an associated

tree in the limber pine/common juniper (PIFL2/JUCOM2) plant community.

Miscellany: Distribution is dependent on Clark's nutcracker for seed dispersal. Seeds are highly nutritious and provide food for birds and rodents. Like whitebark pine, limber pine is susceptible to mortality from whitepine blister rust. Fire incidence is low due to rocky sites and gravelly slopes associated with the trees. Young trees are highly susceptible to mortality due to thin bark. Mature trees are less vulnerable due to thick bark.



Limber Pine

Pinus flexilis

PIFL2

Habit: A stout, often twisted and contorted trunk up to 45 feet tall with diameters averaging 12-30 inches. The exposure near forest line results in gnarled, twisted individuals. Crowns are broad; branches thick - long and flexuous, often drooping.

Big Tree: National Champion - Uinta N.F. (Utah) (Ht. - 58', Circum - 275", Spread - 46', Points - 345).

Oregon Champion - None listed.

Idaho Champion - Caribou NF (Ht. - 73', Circum. - 177", Spread - 52', Points - 263).

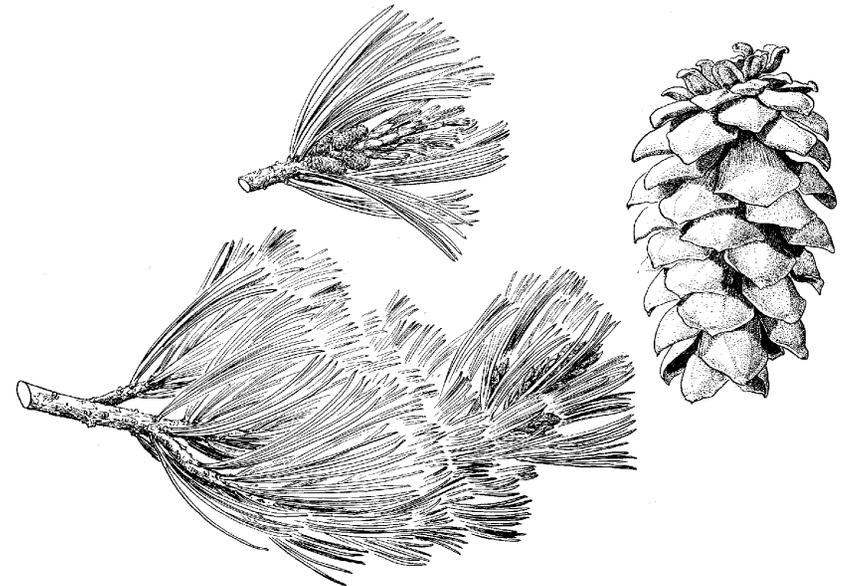
Wallowa-Whitman NF Champion - None listed.

Umatilla NF Champion - None listed.

Stems and Bark: Stems are tough, stout, silvery-white to gray. Bark light gray and smooth in youth; dark brown and fissured with age. Inner bark is reddish brown, up to 2 inches thick. Branches are flexible (adapted for windy, icy, snowy conditions).

Leaves: Needles in fascicles of five, 1.5-3 inches long; yellow-green to dark green; curved slightly and clustered at the end of branches.

Fruit: Cones. Short-stalked, up to 3-7 inches long, ovoid to cylindrical in shape. Thickened scales, reflexed, and unarmed. Yellow brown to brown in color. Seed: 1/3-1/2 inch long, wingless. Falling entirely from the tree.



Western White Pine

Pinus monticola

Family - Pinaceae

PIMO3

Range: Southern British Columbia south to Sierra Nevada of California; Olympic and Cascades; east to northeast Oregon, Idaho, and western Montana.

Habitat: Found in the subalpine of the Strawberry Mountains (Baldy Mountains) on peridotite and basalt. Moist, well drained soils.

Look Alikes: Other 5-needle pines in the subalpine. *P. albicaulis* - cones ovoid (red-purple); leaves thick, not bluish green; bark not platey or block-like. *P. flexilis* - cones ovoid (3-7 inches long); leaves thick, not bluish green; bark fissured - not platey or block-like.

Indicator Value: Indicator species for subalpine fir-western whitepine/prince's pine (ABLA2-PIMO3/CHUM) community types.

Miscellany: Seral species in grand fir and lower elevation subalpine fir forests. Blue grouse prefer the needles; squirrels and mice consume the seeds. Provides hiding and thermal cover for elk. Susceptible to white pine blister rust. Host for the ips beetle. Native Americans collected continuous for food, used bark for baskets and chewed the resin.

Young trees readily killed by fire. Moderate to severe burns damage cambial layer and causes mortality from crown fire. Older trees susceptible

to mortality from root heating due to deep humus and litter. Cool to moderate burns provide mineral soil and enhance opportunity for reoccupation of the site by western white pine. Fire suppression has led to decrease in white pine stocking. Named for its light colored wood. The species name "monticola" means "mountain dwelling." Comes collected for Christmas decorations and floral baskets. Trees planted as ornamentals. The State tree of Idaho.



Western White Pine

Pinus monticola

PIMO3

Habit: Medium-sized tree about 100 feet tall with symmetrical, open crown with conspicuously whorled nodel branches. Taprooted with spreading lateral roots. Branch tops tend to drop. Old veterans have "staghorn" tops - several upright branches at the tree top.

Big Tree: National Champion - El Dorado N.F., California (Ht. - 151', Circum - 394", Spread - 52', Points - 558).

Oregon Champion - Rogue River NF (Ht. - 242', Circum. - 249", Spread - 36', Points - 500).-

Idaho Champion - Clearwater County (Ht. - 229', Circum. - 247", Spread - 24', Points - 482).

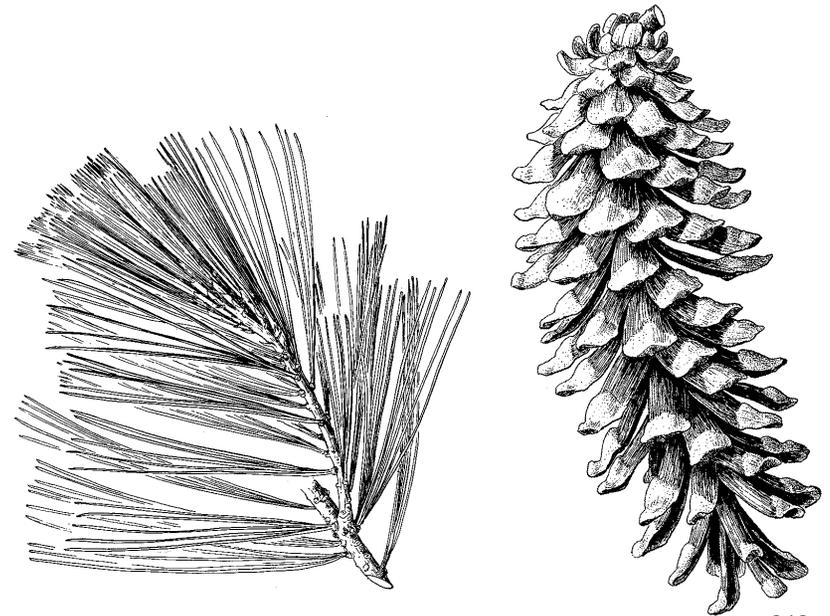
Wallowa-Whitman NF Champion - Grande RD (Ht. - 105', Circum. - 101", Spread - 36', Points - 215).

Umatilla NF Champion - Pomeroy RD (Ht. - 188', Circum. - 189", Spread - 45', Points - 388).

Bark: Young - thin, grey, smooth with resin blisters. Mature - cinnamon brown to dark grey, sealey, separated into rectangular plates or blocks up to 1.25 inches thick.

Leaves: Evergreen. Needles in bundles of 5, thin, flexible, soft, bluish green up to 4 inches long. Persist 3-4 years.

Fruit: Cones. Long, 5-12 inches, cylindrical, narrow and curved, resinous, reddish-brown, unarmed scales. Mature mid-August of second year. Seeds reddish-brown; wings 2-3 times as long.



Ponderosa Pine

Pinus ponderosa (var. *ponderosa*)

PIPO

Family - Pinaceae

Range: Southern British Columbia through Washington, Oregon and California. Extends to Rocky Mountains in Montana and south to Snake River plateau in Idaho (var. *scopulorum* occurs in Great Plains and SW United States).

Habitat: Occurs on warm, dry sites at lower montane elevations and at higher intermountain plateau and valley locations. Occurs on a broad spectrum of soils with best development on deep sandy gravels and loam. Occurs as a seral species in more mesic Douglas-fir and grand fir plant associations. Forms climax communities on warmer, drier sites than the Douglas-fir and true fir climax sites; and on moister sites than where non-forest and juniper plant associations occur.

Look Alikes: Other pines in the western United States. Our only 3-needled pine, ponderosa pine needles are longer than lodgepole pine needles (which are 2-ranked). The rest of the native pines (whitebark, limber, white) are 5-needled.

Indicator Value: Type indicator for ponderosa pine plant associations. Occupies Douglas-fir and drier grand fir plant associations in early and mid seral stages when sites are warmer. Absent from subalpine fir sites except as incidental occupant of microsites. Incapable of sustaining growth on climax juniper, shrubland and grassland sites.

Miscellany: Highly valued for lumber (cabinets, doors, window sash). Elk, deer, porcupines, rabbits browse on leaves; mice, chipmunks, ground squirrels use roots and stems; juncos, finches, siskins, grosbeaks, sparrows, chickadees eat pine seeds. Thickets help hide deer and elk. Cavity nesters use standing pine snags. Eagles, turkeys, hawks use trees

for roosts and nests. Fire needed to promote pine dominance and to discourage fir on drier Douglas-fir and grand fir climax sites. Adapted to fire (thick bark, open stands, smooth boles free of lower limbs, deep root system, and readily seeds on mineral soils). Of the Inland PNW tree species, ponderosa pine provides the greatest contribution to aesthetics (scenery and recreation). Native Americans ate cambium for its sweet, delicious flavor and nourishment; Capt. Lewis used resin to make a salve for abscess. Also used as ointment for rheumatism and backaches and to control dandruff.



Photo by Karl Urban

Ponderosa Pine

Pinus ponderosa (var. *ponderosa*)

PIPO

Habit: Large coniferous tree up to 180 feet tall. A clear, symmetrical bole with an open pyramidal to flat-topped crown.

Big Tree: National Champion - Plumas County, California (Ht. - 227', Circum. - 293", Spread - 68', Points - 537).

Oregon Champion - Deschutes NF (Ht. 178', Circum. - 342", Spread - 45', Points - 531).

Idaho Champion - Boise County (Ht. - 172', Circum. - 228", Spread - 36', Points - 409).

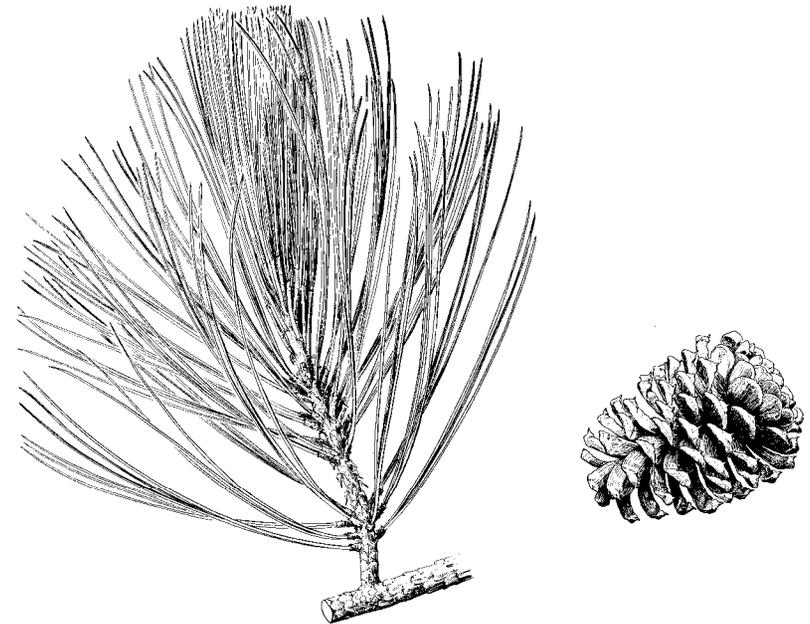
Wallowa-Whitman Champion - Pine RD (Ht. - 180', Circum. - 210", Spread - 41', Points - 400).

Umatilla Champion - Walla Walla RD (Ht. - 166', Circum. - 220", Spread - 37', Points - 395).

Bark: Dark brown to black on young trees, becoming yellow-brown to cinnamon-red on mature trees. Large flat plates between deep furrows on older trees. Scales of plates look like "jigsaw puzzle" pieces.

Leaves: Needles in fascicles of 3, 5-8 inches long; green to yellow-green; flexible; basal sheath 1/4-3/8 inch long.

Fruit: Cones. Staminate cones yellow to purplish and strongly clustered; ovulate cones deep reddish-purple; maturing reddish-brown to brown, 3-6 inch, ovate, sessile cones with chocolate brown scales containing a thickened prickly tip (Flowers: May - June; sheds seeds: September).



Quaking Aspen

Populus tremuloides

Family - Salicaceae

POTR5

Range: Alaska, Canada, northeast and western United States.

Habitat: Streamsides; meadows; moist benches or slopes in the mountains.

Look Alikes: Often confused with black cottonwood (due to light bark on younger trees). Quaking aspen bark is smooth, white to cream-colored. Cottonwood bark is pale gray becoming deeply furrowed in older trees. Look at leaf petioles - flattened on aspen; round on cottonwood.

Paper birch bark is white with horizontal lenticels. Aspen have branch scars that give "black eyes" to the white bark.

Indicator Value: Indicates abundant subsurface water on upland sites. Occurs at higher montane elevations in the Seven Devils Mountains with elk sedge (POTR5/CAGE2).

Miscellany: One of the most glamorous trees in autumn's annual display. The most widely distributed tree species in North America. Highly palatable. One of the most valuable browse species for deer and elk - especially in fall and winter. At higher elevations rabbits, pikes, squirrels, mice, and vole feed on buds, twigs, and bark. Birds using quaking for feeding and nesting are grouse, nuthatch, and siskins. Domestic cattle and sheep browse leaves and twigs.

Native Americans drank a tea from the inner bark in spring when sap was running. Used by herbologists as a tonic for fevers, diuretic for urinary track infections, and to cause diarrhea.



Quaking Aspen

Populus tremuloides

POTR5

Habit: Small tree up to 80 feet tall; diameter 1-2 feet.; rounded crown. Reproduces by suckers from extensive, shallow roots to form clones where all trees are genetically identical.

Big Tree: National Champion - Umatilla National Forest (Lookingglass Creek) - (Ht. 136', Circum. - 120", Spread - 42', Points - 267).

Oregon Champion - Umatilla National Forest (Lookingglass Creek) - (Ht. 136', Circum. - 120", Spread - 42', Points - 267).

Idaho Champion - Kanitsu NF (Ht. - 112', Circum. - 96", Spread - 36', Points - 217).

Wallowa-Whitman NF Champion - None listed.

Umatilla NF Champion - "The Oregon Champion" - Umatilla National Forest (Lookingglass Creek) - (Ht. 136', Circum. - 120", Spread - 42', Points - 267).

Stems and Bark: Greenish-white to creamy-white bark. Older tree bases have furrowed dark bark. Trunks have black "eyes" - branch scars.

Buds: Conical, sharp-pointed, red-brown, slightly resinous, 1/4-3/8 inch long.

Leaves: Alternate: Ovate to round, acute apex, rounded to cordate base; margins crenate-serrate; yellow-green to dark green above, paler in color below; 1.5-3 inches long.

Petiole slender and flatleaved allowing the leaves to rotate (tremble) in the breeze. Leaves turn yellow to golden in autumn.

Flowers: Densely clustered, drooping catkins; flower subtended by cup-shaped disk; male and female catkins on separate trees (Flowers: April - May).

Fruit: Conical capsule; 1/3 inch long; stalk - gray, hairy; seed - light brown and tufted for rapid airborne dissemination.



Douglas-fir
***Pseudotsuga menziesii* (var. *glauca*)**

Family - Pinaceae

Range: The inland variety ranges from southeastern British Columbia to Alberta, to Montana, Idaho, eastern Washington, eastern Oregon, Nevada, Utah, Wyoming, Colorado, New Mexico and Arizona.

Habitat: Moist to dry sites in the mid montane forests. Extends from dry, cool sites in the subalpine fir zone at higher elevations through warmer sites in the grand fir environmental zone to warm, dry sites above the ponderosa pine climax forests. Most abundant in low to middle elevation forests where it forms climax plant communities on warmer, drier sites than true firs and moister, cooler sites than ponderosa pine.

Look Alikes: Use the buds. Douglas-fir buds are singular, sharply pointed and brown; true fir buds are rounded, 3 at branch tip and yellowish. Grand fir (*Abies grandis*) needles are in 2-ranked flat spray; are thicker, broader and do not contain stomatal bloom on top of leaf; subalpine fir (*A. lasiocarpa*) has needles spirally arranged like Douglas-fir but leaves are upturned to spiral rather than oriented spirally.

Indicator Value: Type indicator for Douglas-fir plant associations. Occupies subalpine fir and grand fir climax communities in early and mid seral stages when sites are warmer.

Miscellany: Valuable for timber products (lumber, plywood, ties, general construction, firewood). Provides valuable cover and foraging habitat for deer and elk. Squirrels use the seeds and provide caches. Songbirds using seeds are Clark's nutcracker, nuthatches, crossbills, juncos, and siskins. Blue grouse consume the needles. Grown for Christmas trees and landscaping. On drier sites, dwarf-mistletoe attacks foliage and forms brooms. Western spruce budworm and tussock moth are most serious insect pests. Fire susceptibility is high on young trees; older trees become

more resistant as bark thickens. Often replaced by crown fires at the moist end of occurrence. Underburns are more frequent where Douglas-fir occurs in drier habitats. Used by Native Americans for lumber; roots for basket weaving; fresh needles for tea.



PSME

Douglas-fir
***Pseudotsuga menziesii* (var. *glauca*)**

PSME

Habit: A coniferous tree usually 130-150 feet tall; crown is compact, pyramidal with branches ascending and drooping; leader stiffly erect.

Big Tree: National Champion - Deschutes NF (Ht. - 139', Circum. - 316", Spread - 55', Points - 469).

Oregon Champion - "The National Champion" - Deschutes NF (Ht. - 139', Circum. - 316", Spread - 55', Points - 469).

Idaho Champion - Clearwater Co., ID (Ht. - 209', Circum. - 221", Spread - 24', Points - 437).

Wallowa-Whitman Champion - Pine RD (Ht. - 203', Circum. - 207", Spread - 10', Points - 413).

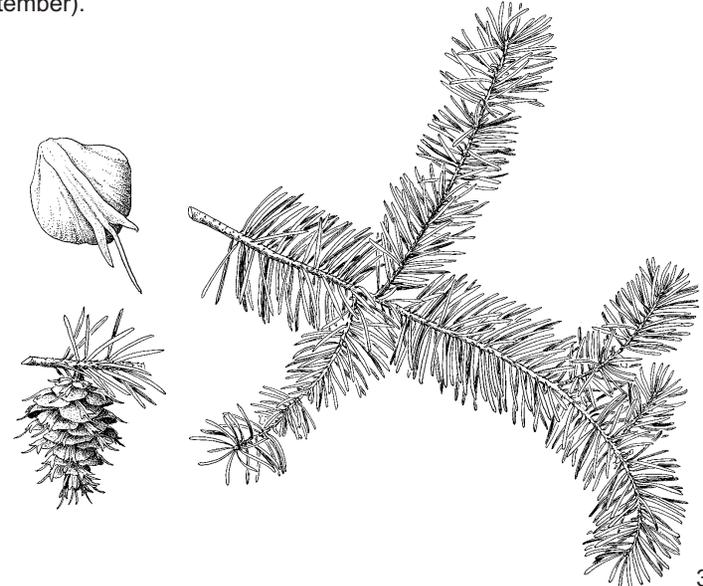
Umatilla Champion - Pomeroy RD (Ht. - 173', Circum. - 251", Spread - 36', Points - 433).

Bark: Thin, smooth with resin blisters (gray) on young trees; rough, thick, 3-10 inches on older trees; reddish-brown; irregular deep furrows with corky grayish to reddish brown layered plates.

Buds: Shiny, sharp pointed, conical, reddish brown to brown.

Leaves: Needles, 3/4-1 inch long; blue-green to yellow-green to gray-green; blunt apex; whitish stomata on upper surfaces and 2 stomatal bands below; spiral arrangement of needles on twig.

Fruit: Pendent cones. Staminate orange-red; ovulate yellowish-green to purplish-green; becoming reddish-brown, 2-4 inches long in maturity; a 3-lobed bract extends beyond the scale with center lobe the longest ("pitchforks" or "tridents") (Flowers: April - May; sheds seeds: August - September).



Mountain Hemlock

Tsuga mertensiana

Family - Pinaceae

TSME

Range: Alaska to California, throughout higher mountains of western Oregon, northern Washington, northern Idaho, western Montana, northeast Oregon to north central Nevada.

Habitat: Subalpine to alpine forests and timberlines (where dwarfed). Occurs on moist, well drained soils (colluvium, alluvium). Confined to northerly and easterly slopes where moisture is retained late into summer. Prominent in a cornice forest where deep, lingering snowpacks provide ideal growing conditions.

Look Alikes: May be confused with western hemlock (*T. heterophylla*) which has needles of differing lengths arranged in 2-ranks on the twig and cones less than 1 inch long. Leaves appear in starlike rosettes on lateral branches of mountain hemlock.

Indicator Value: Type indicator for mountain hemlock plant associations (TSME/VASC, TSME/VAME). Subalpine fir and Engelmann spruce often associated. Often forms pure stands. Successional timeframe is very slow. Indicative of cold soil, frost, short growing season, deep snowpacks.

Miscellany: Provides excellent hiding and thermal cover for wild mammals; important for watershed protection. Used as an ornamental in landscaping with its bluish compact foliage, starlike needle pattern and slow growth. Highly susceptible to laminated root rot (*Phellinus weirii*). Very tolerant of frost. Prone to windthrow due to shallow root system. Stands usually replaced by fire; trees easily killed by fire. Buds used by blue grouse, seeds by siskins and chickadees, twigs and leaves by mountain goat. Native Americans made tea from fresh needles.



Photo by Karl Urban

Mountain Hemlock

Tsuga mertensiana

TSME

Habit: Coniferous tree 100-130 feet tall; narrow crown with drooping leader (buggy whip top).

Big Tree: National Champion - Alpine County, Calif. (Ht. - 113', Circum. - 277", Spread - 44', Points - 401).

Oregon Champion - Deschutes NF (Ht. 112', Circum. - 258", Spread - 40', Points - 380).

Idaho Champion - Shoshone County (Ht. - 136', Circum. - 202", Spread - 34', Points - 347).

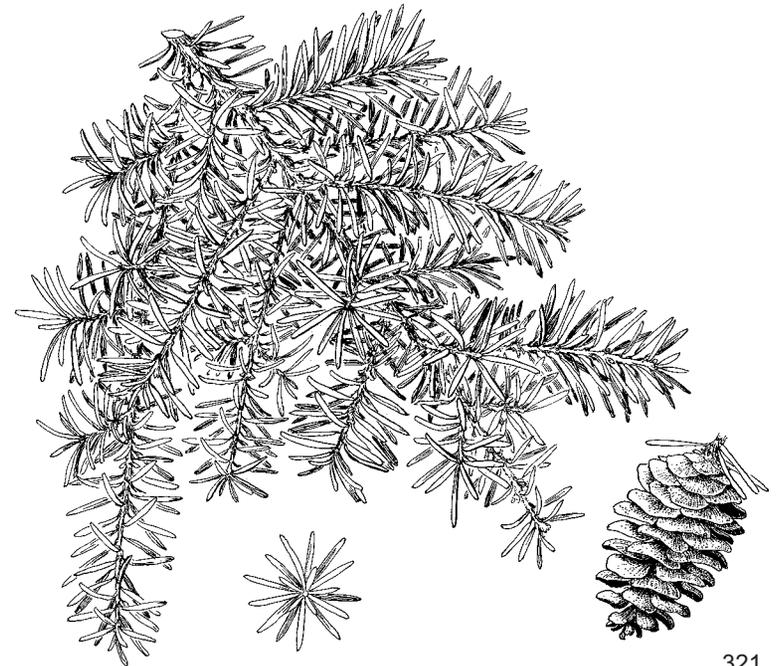
Wallowa-Whitman Champion - La Grande RD (Ht. - 127', Circum. - 139", Spread - 46', Points - 278).

Bark: Dark purplish to reddish brown; deep furrows with narrow rounded ridges; 1-1.5 inches thick.

Buds: Conical, sharp pointed, red-brown, about 1/8 inch long.

Leaves: Needles; thickened at the center; 4-sided; 1/2-1 inch long; dark green (shade) to bluish green (sun) with stomatal bloom on all surfaces; apex blunt; even-length needles arranged spirally about the twig.

Fruit: Cones. Staminate cones bluish, only 3-4 mm long; ovulate cones brownish-purple to deep purple, turning brown on maturity; cylindrical with thin scales, 1-3 inches long; about as long as broad (Flowers: June - July; sheds seeds: August - October).



Rocky Mountain Maple

Acer glabrum

ACGL

Family - Aceraceae

Range: Usually found east of the Cascades in Washington and Oregon. Extends east to Idaho and western Montana where *Acer glabrum* var. *douglasii* becomes more prevalent. Both varieties occur in the Blue and Wallowa Mountains.

Habitat: Moist seepage sites under grand fir and Douglas-fir communities. Indicates higher productivity sites in Douglas-fir/ninebark (PSME/PHMA) communities. Also occurs in riparian communities from low elevation canyon bottoms to mid-montane streamsides.

Look Alikes: Our only maple in the inland Pacific Northwest. May be confused with currants, gooseberries and ninebark. Leaves are opposite with maple and alternate with the look alike.

Indicator Value: Type indicator of Douglas-fir/Rocky Mountain maple-mountain snowberry (PSME/ACGL-SYOR2) communities. Also found in subalpine forests in ABGR/VAME and ABLA2/VAME plant associations. An associate with bittercherry (PREM) shrublands in the Wallowa Mountains.

Miscellany: Persists in open savanna as early to mid seral species in true fir communities. Used by Native Americans for fabricating vessels and smoking of meats. Browsed readily by deer and elk.



Rocky Mountain Maple

Acer glabrum

ACGL

Habit: Deciduous shrub or small tree 3-33 feet tall.

Big Tree: National Champion - Island County, Washington (Ht. - 67', Circum. - 107", Spread - 55', Points - 188).

Idaho Champion - Bonner County, Idaho (Ht. - 80', Circum. - 53", Spread - 32', Points - 141).

Oregon Champion - Hood River County, Oregon (Ht. - 63', Circum. - 6", Spread - 26", Points - 112).

Umatilla NF Champion - Walla Walla RD (Ht. - 49', Circum. - 31", Spread - 28', Points - 87).

Stems: Smooth, reddish-brown bark turning gray with age; buds opposite, red, ovate, often paired.

Leaves: Opposite, deciduous, simple, palmately lobed (3-5 main veins); 2-5 inches in diameter; dark green above (reddish tints) and paler below; petiole-green (var. *glabrum*) or red (var. *douglasii*) and same length as leaf blade.

Flowers: Small, greenish-yellow in axillary clusters (Flowers: April - June).

Fruit: Double samara, 1 inch long, joined at acute or right angle.



Pinemat Manzanita

Arctostaphylos nevadensis

ARNE

Family - Ericaceae

Range: Cascades of Washington and Oregon eastward to the Blue Mountains.

Habitat: Early seral stands of ponderosa pine, lodgepole pine, and grand fir-dominated communities. Often increases on heavily logged areas.

Look Alikes: Bearberry; kinnikinnick (round leaf tips - bright red berry; more prostrate); twinflower and pachistima (opposite leaves with serrated margins).

Indicator Value: Type indicator for subalpine fir/pinemat manzanita/prickly sandwort (ABLA/ARNE/ARAC7), subalpine fir-whitebark pine/common juniper/pinemat manzanita (ABLA-PIAL/JUCO6/ARNE), whitebark pine/common juniper/pinemat manzanita (PIAL/JUCO6/ARNE), and Douglas-fir/pinemat manzanita/elk sedge (PSME/ARNE/CAGE).

Miscellany: Berries are eaten by wildlife; leaves boiled and used by Native Americans for curative teas, and smoked as a tobacco substitute. Plant is not used by browsing animals. The mat-forming characteristics of this species provides erosion control protection on highly disturbed sites. A fine ground cover for horticulturists. Used for jellies, cobblers, pies, and winemaking.



Pinemat Manzanita

Arctostaphylos nevadensis

ARNE

Habit: Trailing evergreen shrub with rooting stems up to 10 inches tall.

Stems: Brownish to reddish with peeling bark.

Leaves: Evergreen; alternate; thick; 1 inch long, leathery; spatulate form with a sharp-pointed tip; dark green above.

Flowers: White to pinkish-white; urn-shaped; few-flowered terminal racemes (Flowers: June - July).

Fruit: Round, brownish-red berry-like drupe.



Low Sagebrush

Artemisia arbuscula (ssp. *arbuscula*)

ARAR8

Family - Compositae

Range: Washington to California (east of Cascades); eastward to Montana, Wyoming, Colorado and New Mexico. In the Pacific Northwest it occurs in the northern Great Basin of central Oregon, in Cascade and Siskiyou Mountains, and in the western part of the Columbia Plateau of Washington.

Habitat: Dry, rocky slopes and ridges in the mountains; dry foothills and flats. Occurs on soils deeper than scablands (10 inches); and of less depth than deeper soils containing big sagebrush (greater than 24 inches average).

Look Alikes: Bitterbrush (*Purshia tridentata*) lacks silvery, hairy leaves and has no sage aroma. Other shrubby sagebrush species found in the inland northwest can be differentiated as follows: big sagebrush (*Artemisia tridentata*) - taller (over 16 inches tall) with wider panicle inflorescence; stiff sagebrush (*A. rigida*) - leaves deeply cleft; silver sage (*A. cana*) - leaves entire.

Indicator Value: Type indicator for the low sagebrush. Idaho fescue-bluebunch wheatgrass (ARAR/FEID-AGSP) plant association in the southern and west central Blue Mountains.

Miscellany: Important to mule deer, pronghorns, sage grouse (especially in spring and winter). Ground squirrels and rabbits utilize the foliage and seeds. Little used by cattle; sheep use it during fall and winter. Does not sprout following fire; but does disperse abundant seed. Fire does not carry well in low sagebrush communities. Seeds may be dried and made into flour or eaten raw. Leaves can be boiled for tea for colds, sore eyes and as a hair tonic.



Low Sagebrush

Artemisia arbuscula (ssp. *arbuscula*)

ARAR8

Habit: Low shrub up to 16 inches tall with rounded form. Erect stems. Taprooted with spreading fibrous roots.

Leaves: Deciduous; alternate; hairy; wedge-shaped with 3 lobes on tip, approx. 1/2 inch long.

Flowers: Narrow, spikelike, less than 3/4 inch wide; flowers sessile in leaf axils; bracts shingle-like in orientation; yellow (Flowers: July - September).

Fruit: Glabrous achene.



Mountain Big Sagebrush

Artemisia tridentata (ssp. *vaseyana*)

ARTRV

Family - Asteraceae

Range: Widespread in the Pacific Northwest at higher montane elevations east of the Cascades.

Habitat: Rocky and gravelly basaltic soils with special affinity to granitic substrates.

Look Alikes: Basin big sagebrush (*A. tridentata* spp. *tridentata*) has inflorescences staggered on the plant. Bitterbrush (*Purshia tridentata*) has dark green tri-lobed leaves that are not hairy.

Indicator Value: Higher elevations of sagebrush shrublands or tree savanna where whitebark pine, subalpine fir, and lodgepole pine occur. Type indicator for mountain big sagebrush plant associations (ARTRV/BRCA5, ARTRV/CAGE2, ARTRV/FEID-AGSP, ARTRV/FEVI, ARTRV/LINU4, and ARTRV-SYOR2/BRCA5). Also associated with subalpine fir communities (ABLA/CAGE2, ABLA/STOC2). Key component of bittercherry (PREM) shrublands.

Miscellany: Lightly used by deer. Native Americans use for shelter, cordage, basketry. Fruits can be used fresh, dried, or pounded into a meal.



Mountain Big Sagebrush

Artemisia tridentata (ssp. *vaseyana*)

ARTRV

Habit: Medium-sized aromatic shrubs usually 2-4 feet tall.

Stems: Silvery-gray in youth; becoming grayish brown; bark shreds on older stems; tends to root when branches touch ground.

Leaves: Deciduous and winter persistent leaves; alternate; 1/2-1.5 inches long; cuneate (triangular); 3-lobed apex; silvery green above and below; strong scented.

Flowers: Small, yellow; tubular (Flowers: August - September).

Fruit: Small achene.



Creeping Oregon-Grape

Berberis repens

BERE

Family - Berberidaceae

Range: Eastern Washington and eastern Oregon in the Pacific Northwest.

Habitat: Drier, well-drained sites often on steep montane or canyon slopes.

Look Alikes: Tall Oregon-grape (*Berberis aquifolium*) has longer leaflets, 7-9 in number; which are glossy and lighter in color than other Oregon-grapes.

Indicator Value: Found over a wide range of plant association from forests to grasslands to shrublands. In the subalpine forests it is found prominently with Douglas-fir (PSME/ARNE/CAGE, PSME/SYOR2/CAGE2, PSME/CARU); with grand fir (ABGR/VAME, ABGR/CARU); and subalpine fir (ABLA/VAME, ABLA/CARU). A strong component of bittercherry (PREM) and mountain snowberry (SYOR2) shrublands.

Miscellany: Native Americans used the berries for food; roots for yellow dye, and its alkaloid (berberine) as a cure for stomach and bowel disorders. Berries are good raw, cooked for jelly, or made into wine. Young leaves palatable to deer. The State flower of Oregon is *B. aquifolium*.



Creeping Oregon-Grape

Berberis repens

BERE

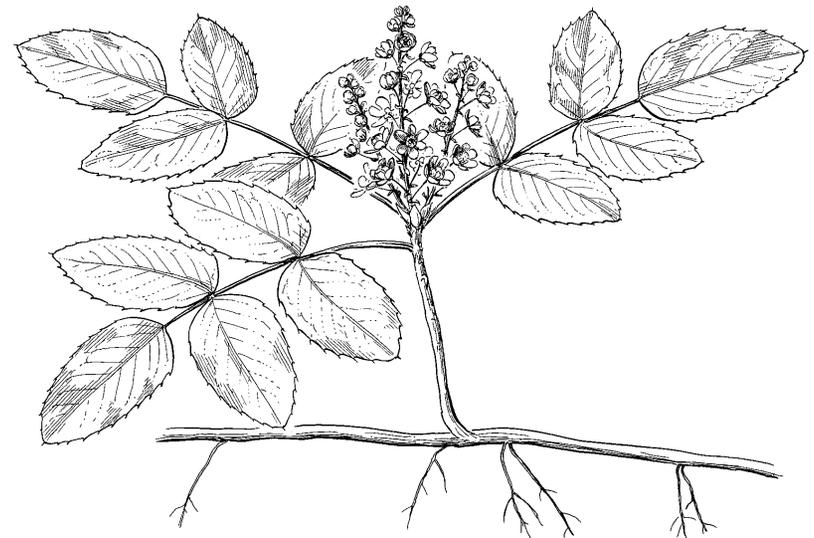
Habit: Low, creeping shrub usually less than 12 inches high.

Stems: Rhizomatous, often forming dense patches.

Leaves: Evergreen, alternate, pinnately compound with 5-7 leaflets. Margins are "holly-like" with spinose teeth. Leaflets are less than twice as long as broad, dull green, and usually non-glossy above.

Flowers: Buttery yellow, bunched into racemes (Flowers: March - June).

Fruit: Dark blue berries with a glaucous dusting.



Curlleaf Mountain-Mahogany

Cercocarpus ledifolius

CELE3

Family - Rosaceae

Range: Southern and eastern Oregon extending through southeastern Washington to the Rockies.

Habitat: Warm, dry rocky ridges and rim outcroppings.

Look Alikes: Quite distinctive.

Indicator Value: Type indicator for mountain-mahogany/Idaho fescue-bluebunch wheatgrass (CELE3/FEID-AGSP) plant associations; mountain-mahogany/elk sedge (CELE3/CAGE2) and Rocky Mountain juniper/mountain-mahogany (JUSC/CELE3) plant communities.

Miscellany: Important deer winter range species. A good place to find the big buck is in thickets of curlleaf mountain-mahogany. Wood used for fuel and smoking of meats by Native Americans. They also used leaves for a laxative, inner bark for pulmonary problems, and wood for arrow shafts and digging implements due to its hardness and strength. A red dye was made from bark and roots.



Curlleaf Mountain-Mahogany

Cercocarpus ledifolius

CELE3

Habit: Evergreen shrub generally 15 feet tall and occasionally 40 feet tall and treelike.

Big Tree: National Champion - Shell Creek Range, Nevada (Ht. - 21', Circum. - 78", Spread - 31', Points - 107).

Oregon Champion - Fremont NF (Ht. - 25', Circum. - 8", Spread - 35', Points - 90).

Idaho Champion - Caribou County (Ht. - 28', Circum. - 52", Spread - 16', Points - 84).

Wallowa-Whitman NF Champion - La Grande RD (Ht. - 20', Circum. - 38", Spread - Inc., Points - Inc.).

Umatilla NF Champion - North Fork John Day RD (Ht. - 21', Circum. - 62", Spread - 23', Points - 89).

Stems and Bark: Reddish-brown becoming grayish-brown in age. Bark is grayish-brown with rough, deeply furrowed bark and plate-like scales.

Leaves: Evergreen, alternate, 1/2-1 inch long; dark green on upper surface with pale, pubescent underside. Thick and leathery with blade edges curling under.

Flowers: Greenish-white, inconspicuous, in axillary clusters (Flowers: April - June).

Fruit: Narrow achene with distinctive curled, long, twisted plume.



Prince's Pine, Western Pipsissewa

Chimaphila umbellata
Family - Ericaceae

CHUM

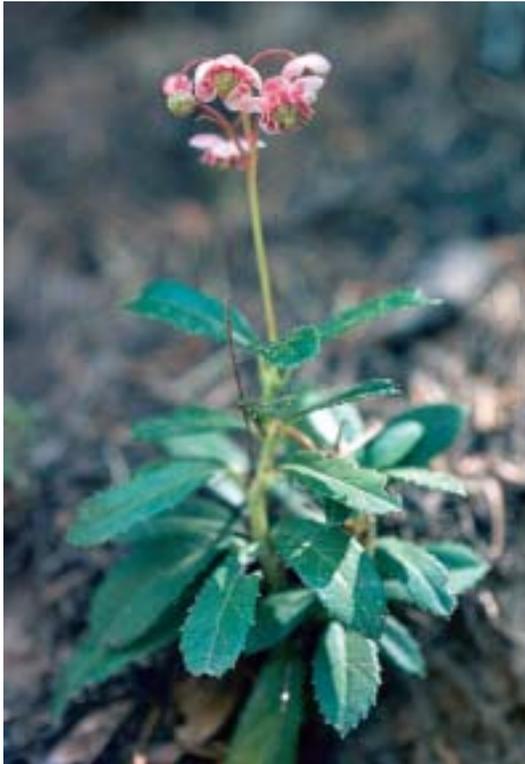
Range: Widespread throughout mountains of Pacific Northwest.

Habitat: Mid to high elevation cool, moist sites that may be shady or exposed.

Look Alikes: Little pipsissewa (*Chimaphila menziesii*) - usually has less than 3 flowers with dull green to blue-green elliptical leaves.

Indicator Value: Cool, moist subalpine communities in grand fir, subalpine fir, and mountain hemlock plant associations. Type indicator for ABLA-PIMO3/CHUM community type. Common in ABGR/VAME, ABLA/VAME, ABLA/VASC, ABLA-PIEN/MEFE, TSME/VAME plant associations. High fidelity with huckleberries.

Miscellany: Roots and leaves boiled for refreshing drink when chilled; used as an ingredient for root beer. Used by pharmaceutical companies for its astringent properties. Unpalatable.



Prince's Pine, Western Pipsissewa

Chimaphila umbellata

CHUM

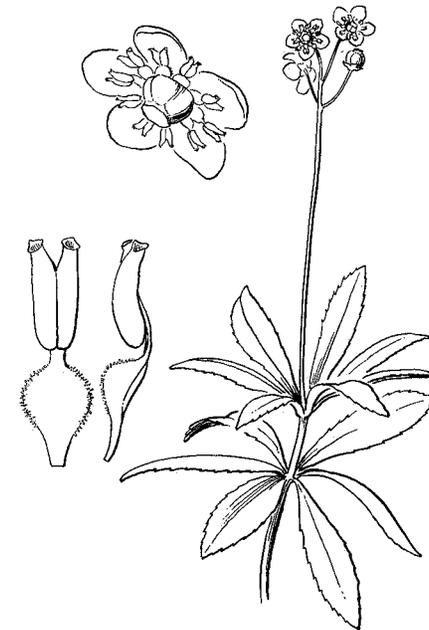
Habit: Small, erect rhizomatous sub-shrub usually 4-12 inches tall.

Stems and Bark: Unbranched, glabrous, woodyish base; yellowish-green.

Leaves: Evergreen, simple, alternate, 2-3 inches long, bright green, oblanceolate, whorled, serrated margins.

Flowers: Waxy, whitish-pink to pink, 3-15 in clustered racemes (Flowers: June - August).

Fruit: Rounded 5-celled capsules.



Common Juniper

Juniperus communis var. *montana*

JUCOM2

Family - Cupressaceae

Range: Alaska, Canada; throughout foothills and mountains of western North America to central Sierras of California; east to Nebraska, Ohio, and south in Appalachians to Georgia.

Habitat: Ridges and mountain slopes on rocky, gravelly substrates. One of the last shrubs to persist above treeline in the alpine environment.

Look Alikes: Differs from other junipers with its sharp, needle-like, pointed leaves in whorls of 3. Other junipers have scale-like leaves. Usually spreading to prostrate. Other junipers are upright.

Indicator Value: Rocky, gravelly to sandy sites where deep roots of the juniper can reach subsurface water and colonize in large patches. Indicators of the ABLA-PIAL/JUCOM2, PIFL2/JUCOM2, PIFL2/JUCOM2, and JUCOM2 community types.

Miscellany: Lightly used by deer and mountain goats. Cones used by black-capped chickadees and robins. Used by Native Americans for teas to treat colds, flu, muscle aches, and kidney problems. Extracts from the fruit used to flavor gin. Generally unburned by wildfire. If burned it is very susceptible to severe and moderate fire severities. It does not sprout.



Common Juniper

Juniperus communis var. *montana*

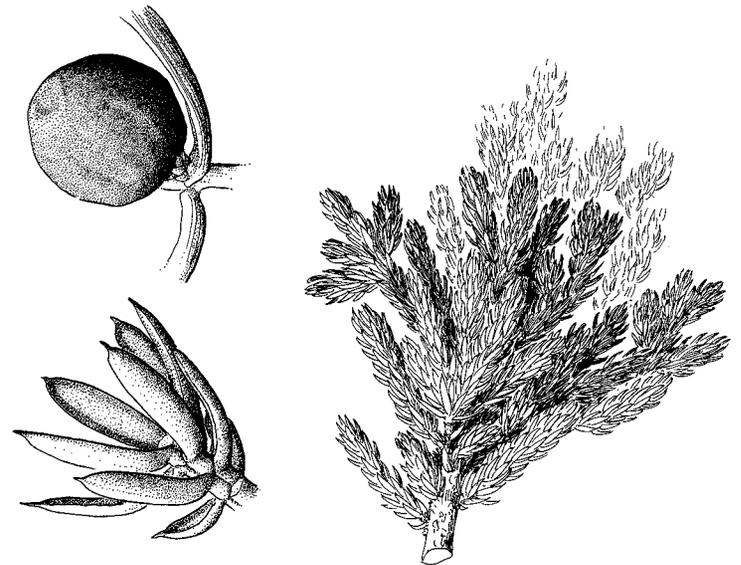
JUCOM2

Habit: A low spreading or prostrate shrub usually under 5 feet tall. Forms large patches, mats, or clumps.

Stems and Bark: Stems are shiny, triangular in cross section. Bark is thin, 1/4 inch thick, shredding, reddish-brown to gray.

Leaves: Stiff, linear-lanceolate, sharp pointed, in whorls of 3, sessile; up to 1/2 inch long. Whitish-green above, dark shiny green below.

Fruit: Dioecious (male and female cones on separate shrubs); female cones berry-like, bluish-purple with glaucous bloom. Mature the second season; 1-3 seeds per fruit.



Labrador Tea

Ledum glandulosum

Family - Ericaceae

LEGL

Range: British Columbia to California (east of Cascade Mountains); Rocky Mountains south to Wyoming; north and central Idaho and northeast Oregon.

Habitat: Riparian, boggy meadows, moist forest.

Look Alikes: White rhododendron (*Rhododendron albiflorum*) has a larger flower with only 1-4 per stem; leaves not glandular or inrolled; Fool's huckleberry (*Menziesia ferruginea*) leaves are deciduous, light or dull green and thin.

Odor of crushed leaves: white rhododendron = none; Fool's huckleberry = bad smell; Labrador tea = fragrant smell.

Indicator Value: Acidic, wet, low nutrient soils. Type indicator for ABLA-PIEN/LEGL plant association.

Miscellany: Also known as Trapper's tea. Contains an alkaloid toxic to livestock (especially sheep). Trapper's tea must be boiled at length to destroy the alkaloids.



Labrador Tea

Ledum glandulosum

LEGL

Habit: Erect shrub, 2-6 feet tall; evergreen.

Stems and Bark: Older stems smooth; younger stems glandular with fine hairs.

Leaves: Evergreen; alternate; ovate to oblong to elliptic; entire margins; 1-2 inches long; green to dark green above, light green below; resinous yellow glands below; margins tend to be inrolled. Fragrant.

Flowers: White; small; inflorescence a terminal raceme; petals - 5; stamens - 10 protruding (Flowers: June - August).

Fruit: Ovoid capsule.



Twinflower

Linnaea borealis

Family - Caprifoliaceae

LIBO3

Range: Circumboreal; prevalent in forests of the Pacific Northwest.

Habitat: A cool, moist forested plant preferring ashy soils. Occurs in partial shade, but prefers dark, densely canopied forest overstory cover.

Look Alikes: Leaves could be mistaken for wintergreens (*Pyrola* spp.) or bearberry (*Arctostaphylos* spp.). Twinflower has opposite leaves.

Indicator Value: Important indicator of cool, moist, dark grand fir and subalpine fir plant associations in the subalpine (ABLA/LIBO3, ABLA-PIEN/LIBO3, ABLA-PIEN/LEGL).

Miscellany: A good horticultural ground cover. Unpalatable. Often increases with light disturbance following logging. The generic name is in honor of Carolus Linnaeus of Sweden - the father of the binomial plant classification system. This was his favorite flower.



Twinflower

Linnaea borealis

LIBO3

Habit: Trailing sub shrub.

Stems and Bark: Slender, woody stems less than 5 inches tall.

Leaves: Opposite on short petioles, evergreen, leathery, elliptic, 1/2 inch lustrous green; shallow teeth near leaf apex.

Flowers: Pinkish to white, paired, nodding bell-shaped on slender flower stalks (Flowers: June - September).

Fruit: Small, 1-seeded capsules.



Bearberry Honeysuckle

Lonicera involucrata

Family - Caprifoliaceae

LOIN5

Range: Throughout forests of Pacific Northwest.

Habitat: Cool, moist to cold, wet sites at higher elevations.

Look Alikes: Utah honeysuckle (*L. utahensis*) - red, twin berries.

Indicator Value: Indicates cold, wet or cool, moist spruce and subalpine fir sites in the subalpine. Common at low coverages in ABLA-PIEN/MEFE, ABLA/VASC, and ABLA/VAME plant associations.

Miscellany: Berries may be eaten raw or dried; browsed by elk and deer; berries eaten by grouse and bear.



Bearberry Honeysuckle

Lonicera involucrata

LOIN5

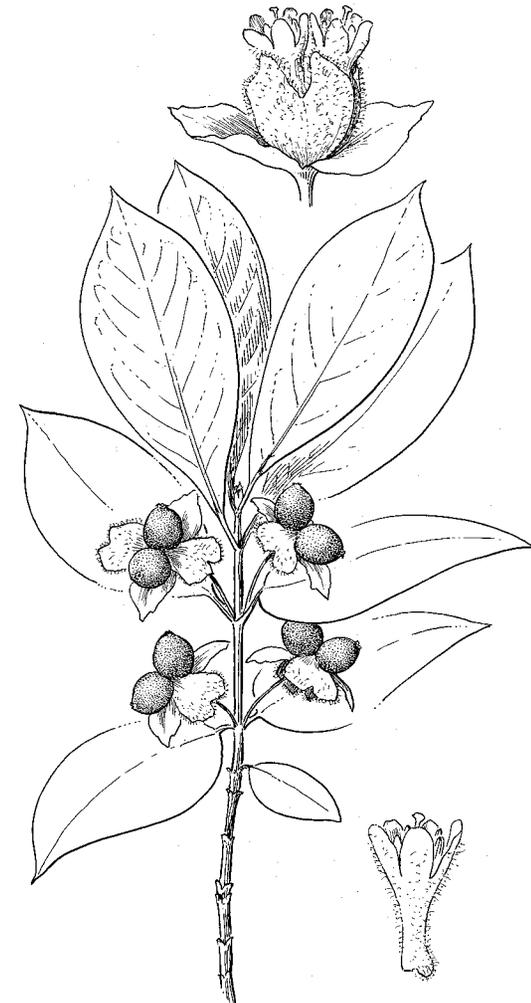
Habit: Erect mid-tall shrub, up to 12 feet; thicket forming.

Stems and Bark: Yellowish or grayish-brown; shredding older bark.

Leaves: Opposite, deciduous, up to 5 inches long, elliptical, dark green above, paler below; entire margins with acute apex.

Flowers: Yellow to reddish-yellow in pairs; glandular-pubescent; subtended by large bracts that become red at fruiting time (Flowers: June - August).

Fruit: Paired purple to black berries 1/4 inch in diameter.



Utah Honeysuckle

Lonicera utahensis

Family - Caprifoliaceae

LOUT2

Range: Throughout Pacific Northwest except for Oregon Coast Range.

Habitat: Moist, cool sites in grand fir and subalpine fir zones. More widespread than bearberry honeysuckle (*Lonicera involucrata*), but not very abundant.

Look Alikes: Very commonly mistaken for snowberries (*Symphoricarpos* spp.), but habitats do not usually overlap. Utah honeysuckle (*L. involucrata*) has broader, longer, darker leaves with red fruits.

Indicator Value: Defines true fir potential sites. Common in subalpine fir plant associations (ABLA/VAME, ABLA/VASC, ABLA/POPU3, ABLA/ARCO9); subalpine fir-Engelmann spruce plant associations (ABLA-PIEN/LEGL, ABLA-PIEN/MEFE, ABLA2-PIEN/ARCO9); and under mountain hemlock.

Miscellany: Leaves used by Native Americans for colds and sore throats; berries are edible; used by deer and elk - low in palatability.



Utah Honeysuckle

Lonicera utahensis

LOUT2

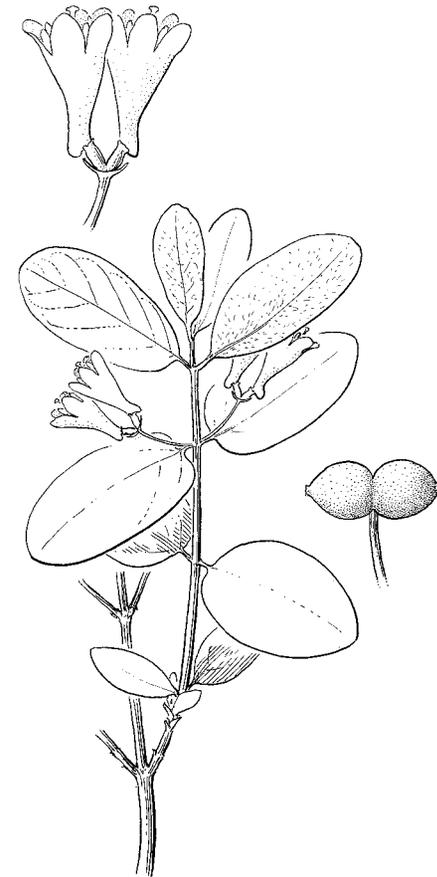
Habit: Low to mid-sized shrub with few erect branches, 3-5 feet tall.

Stems and Bark: Dull gray with solid white pith.

Leaves: Opposite, deciduous, elliptic to ovate, green to dark green, 1-2 inches long.

Flowers: Light yellow, paired, tubular corolla, 1 inch long (Flowers: May - July).

Fruit: Paired, shiny red united berries, 1/4 inch.



Fool's Huckleberry

Menziesia ferruginea

Family - Ericaceae

MEFE

Range: Widespread in Pacific Northwest; occasional in Seven Devils and adjacent Oregon.

Habitat: Defines cold, wet sites on gentle slopes and cornice sites on steep north aspects at high elevation locations.

Look Alikes: Cascades rhododendron (*Rhododendron albiflorum*) has white azalea-like flowers; Labrador-tea (*Ledum glandulosum*) has evergreen leaves with rolled margins; and big huckleberry (*Vaccinium membranaceum*) has alternate leaves without a whorled appearance.

Indicator Value: Defines the ABLA-PIEN/MEFE plant association.

Miscellany: Low in palatability; poisonous to livestock if used in quantity.



Fool's Huckleberry

Menziesia ferruginea

MEFE

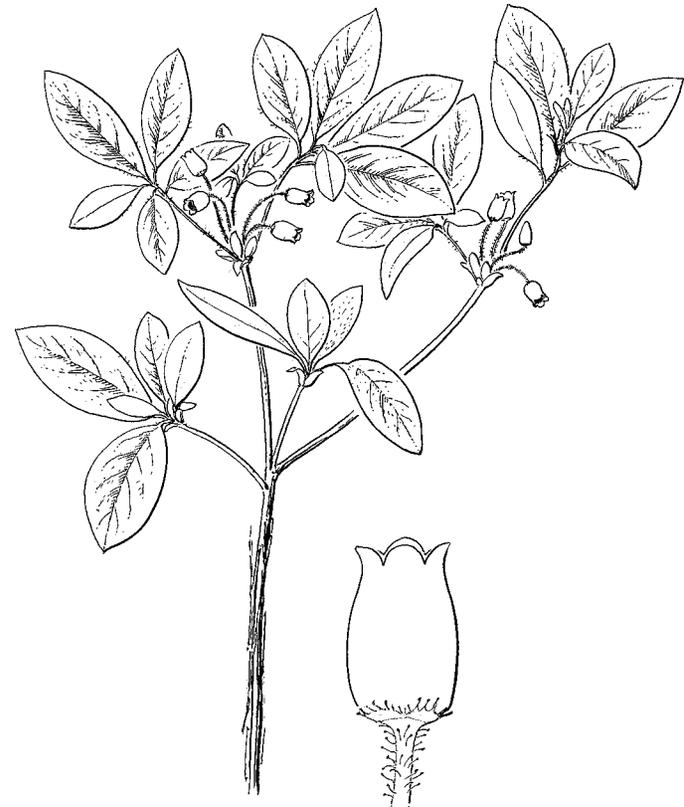
Habit: Deciduous, straggling shrub, up to 6 feet tall; usually reclined downslope on steep cornice sites forming dense thickets.

Stems and Bark: Yellow-tan, pubescent new twigs; gray-reddish brown older stems and shredding bark.

Leaves: Alternate (appearing whorled); deciduous ovate to elliptic, 2 inches long; thin; dull light green to glaucous green; brownish, glandular hairs with finely serrated margins. Mid vein protrudes from leaf tip.

Flowers: White to pinkish white; urn-shaped; borne in clusters (Flowers: June - July).

Fruit: Many-seeded ovoid capsule.



Pachistima, Oregon Boxwood

Pachistima myrsinites

Family - Celastraceae

PAMY

Range: Throughout the Pacific Northwest.

Habitat: Usually in open or shaded, well-drained soils. Also occurs on ash soils at higher montane elevations.

Look Alikes: May possibly be confused with bearberries (*Arctostaphylos* spp.) which have alternate, entire leaves.

Indicator Value: Early seral subalpine fir communities (especially with grouse huckleberry, big huckleberry, twinflower). Also a strong component in the Douglas-fir/pinemat manzanita/elk sedge (PSME/ARNE/CAGE2) plant association.

Miscellany: Excellent for horticultural use; may be shaped into hedges. Used for backdrop in floral arrangements. Deer and elk relish the plant. The specific name "*myrsinites*" means "myrtle-like." Another common name is myrtle boxwood.



Photo by Bruce Barnes

Pachistima, Oregon Boxwood

Pachistima myrsinites

PAMY

Habit: Low growing, up to 2 feet tall, evergreen shrub.

Stems and Bark: Reddish-brown and ridged to 4 angles.

Leaves: Opposite, evergreen, dark green, glossy, oblanceolate, serrated, thick and leathery.

Flowers: Maroon, small, borne in axillary clusters (Flowers: April - June).

Fruit: Small, white aril covering dark brown seeds.



Pink Mountain-Heath

Phyllodoce empetriformis

Family - Ericaceae

PHEM

Range: High mountains of the Pacific Northwest.

Habitat: Alpine and subalpine sites on well-drained soils.

Look Alikes: Cassiope (*Cassiope mertensiana*) has scale leaves and white flower. Yellow mountain-heath (*Phyllodoce glanduliflora*) has yellow-white flowers.

Indicator Value: Indicates cold environments in subalpine fir and whitebark pine zones where regeneration and revegetation will be extremely difficult. Type indicator for ABLA-PIAL/VASC-PHEM, ABLA/VASC-PHEM, and ABLA-PIEN/VASC-PHEM community types. Commonly found in ALBA/VASC, ABLA-PIAL/VASC/ARCO9, and ABLA-PIEN/LEGL plant associations.

Miscellany: Unpalatable plant. Attractive in its natural setting.



Pink Mountain-Heath

Phyllodoce empetriformis

PHEM

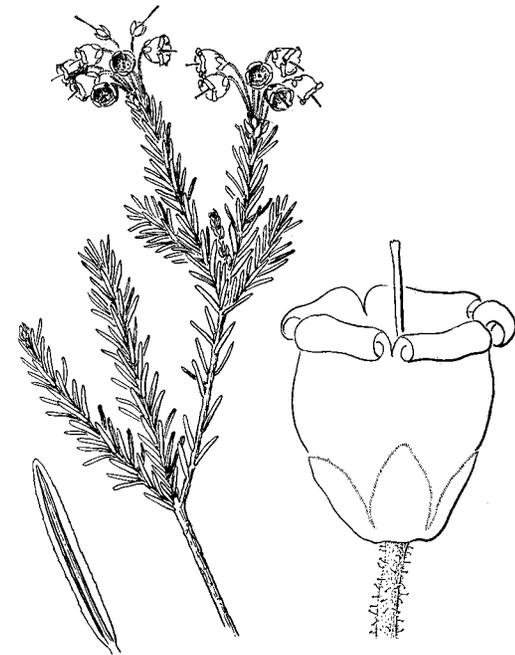
Habit: Matted evergreen shrub, 4-20 inches tall.

Stems and Bark: Fine, short, hairy in youth, becoming glabrous.

Leaves: Alternate, evergreen, linear needle-like, 1/2 inch long, grooved beneath and rolled under to help reduce transpiration.

Flowers: Deep pinkish-rose, bell-shaped, and clustered at stem tips (Flowers: June - August).

Fruit: Ovoid 5-valved capsule.



Shrubby Cinquefoil

Potentilla fruticosa

Family - Rosaceae

POFR4

Range: Alaska south to Sierra Nevada Mountains of California; south in Rocky Mountains to New Mexico and Arizona; across Canada to Labrador and Nova Scotia; southward to northern New Jersey.

Habitat: Tolerates cold temperatures in alpine meadows, subalpine shrublands, and grasslands. Prefers moisture saturated deep soils. Found on mountain slopes, scree, subalpine cirque meadows, and fellfields.

Look Alikes: *Potentilla glandulosa* (sticky cinquefoil) and *Potentilla gracilis* (slender cinquefoil) are forbs with herbaceous (non-woody) stems.

Indicator Value: Indicator of the shrubby cinquefoil/Idaho fescue (POFR4/FEID) plant community type and shrubby cinquefoil (POFR4) cold air drainage communities.

Miscellany: Highly used by horticulturists for hybridizing new varieties for floral garden use. Browsed extensively by mule deer. Increases on overused rangelands. Domestic livestock will hedge the plants on depleted rangelands. Used as a tea substitute by Native Americans. "Cinquefoil" means "five leaves" in latin (referring to the usual number of leaflets per compound leaf).



Shrubby Cinquefoil

Potentilla fruticosa

POFR4

Habit: Spreading to erect; extensively branched; deciduous; up to 50 inches tall.

Stems and Bark: Reddish brown, shredding bark at maturity.

Leaves: Alternate; pinnately compound with 3-7 (usually 5) linear, entire leaflets, up to 3/4 inch long; grayish beneath; covered with silky hairs giving a gray-green cast to foliage.

Flowers: Bright yellow to golden yellow (like a buttercup); 5 broad obovate petals, almost 1/2 inch long; calyx saucer-shaped with 5 spreading sepals; stamens numerous; clustered into few-flowered corymbs or solitary in leaf axils (Flowers: June - August).

Fruit: Light brown achene covered with white hairs.



Bitter Cherry

Prunus emarginata

Family - Rosaceae

PREM

Range: British Columbia to Southern California; inland from Washington and Oregon to Montana; south in the Rockies to Arizona.

Habitat: Moist forest, along streams, and on open, rocky mountain slopes.

Look Alikes: Differentiated from choke cherry (*Prunus virginiana*) which has glands on the petiole at the base of the leaf; bitter cherry has glands on the leaf base next to the petiole. Serviceberry (*Amelanchier alnifolia*) leaves have no glands; its leaf veins are strongly paralleling.

Indicator Value: Dense thickets of bitter cherry often caused by severe fire or avalanches in subalpine ecosystems. Indicator of bitter cherry (PREM) plant communities.

Miscellany: Valuable browse for mule deer, elk, and black bear. Fruits used by birds, rodents and small mammals. Highly palatable to domestic sheep.

Native Americans used fruits for laxatives; roots and inner bark boiled for tea to prevent heart troubles. Outer bark was used for baskets.

Top-killed by severe burns. Sprouts vigorously from root crowns and roots after severe burns. Increases its occupancy rapidly after severe burns. Stones (seeds) of fruits are poisonous (contain cyanide).



Bitter Cherry

Prunus emarginata

PREM

Habit: A tall shrub to small tree, 3-50 feet tall. Often forms dense thickets. Roots spread widely and can send up adventitious shoots.

Big Tree: National Champion - Vashon Island, WA (Ht. - 104'; Circum. - 110"; Spread - 45'; Points - 225).

Oregon Champion - Lincoln County (Ht. 69'; Circum. - 100"; Spread - 40'; Points - 179).

Idaho Champion - Kaniksu National Forest (Ht. 52'; Circum. - 27"; Spread 5'; Points - 84).

Umatilla National Forest Champion - Walla Walla Ranger District (Ht. 22'; Circum. - 14"; Spread - 14'; Points 40).

Stems and Bark: Bronze to deep reddish brown. Lenticels horizontal and prominent; twigs smooth and dark reddish brown.

Leaves: Alternate, deciduous, elliptic to oblong - obovate; rounded at the tip. Finely toothed margins; 1-2 inches long; 1/2-1.5 inches wide; glands located at the base of leaf next to the petiole.

Flowers: White. Inflorescence corymbose with 5-8 in a cluster. Petals obovate - 1/4 inch long; stamens approximately 20 (Flowers: May - June).

Fruit: Bright red drupe; ovoid; dries black; very bitter to taste!



White Rhododendron

Rhododendron albiflorum

RHAL2

Family - Ericaceae

Range: British Columbia, Washington, Oregon, northern Idaho, western Montana.

Habitat: Moist slopes in subalpine fir forests. Often with Engelmann spruce.

Look Alikes: Easily mistaken for two shrubs commonly found in subalpine fir forests. Labrador tea (*Ledum glandulosum*) has resinous yellow glands on underside of leaves and has inrolled leaf margins. Fool's huckleberry (*Menziesia ferruginea*) leaves are dull, light green to glaucous green and has urn-shaped flowers whereas white rhododendron leaves are yellowish-green and flowers are cup or bell-shaped.

Indicator Value: Like fool's huckleberry in the Seven Devils, white rhododendron occupies cold, moist slopes in the Elkhorn Mountains where subalpine fir and Engelmann spruce are associated (ABLA-PIEN/RHAL2).

Miscellany: All plant parts are toxic to humans and cattle. Difficult to propagate in gardens. The only rhododendron in the northern Rocky Mountains.



White Rhododendron

Rhododendron albiflorum

RHAL2

Habit: Deciduous, medium-size shrub, 3-7 feet tall.

Stems and Bark: New stems with coarse, reddish hairs.

Leaves: Alternate (appearing whorled at stem tips); deciduous; elliptic to oblanceolate; entire to undulating margins; length: 2-4 inches; light to yellowish green; clustered near the branch end; mid vein covered with white hairs on underside of leaf.

Flowers: White, cup-shaped with spreading lobes - 5; 3/4-1 inch across; stamens - 10, exserted; inflorescence; axillary clusters of 1-4 (Flowers: July - August).

Fruit: Woody, persistent oval capsules.



Mountain Gooseberry

Ribes montigenum

Family - Grossulariaceae

Range: Southern British Columbia south on east slope of Cascades to S. California. Rocky Mountains of British Columbia south to Montana and New Mexico.

Habitat: Talus slopes, rocky crevices, and subalpine ridgetops near treeline.

Look Alikes: Other armed gooseberries or currants (*Ribes* spp.). Swamp gooseberry (*Ribes lacustre*) has glossy leaves whereas alpine prickly currant has glandular hairy leaves that are only half the size of swamp gooseberry leaves.

Indicator Value: Mountain gooseberry occupies the highest, most exposed sites in the subalpine forest. Type indicator for ABLA-PIAL/RIMO2/POPU3, PIAL/RIMO2/POPU3, and PSME/RIMO2/POPU3 communities.

Miscellany: Slightly palatable to humans.



Mountain Gooseberry

Ribes montigenum

RIMO2

Habit: Spreading, low to medium shrub, up to 50 inches tall.

Stems and Bark: Heavily armed with slender, bristly internodal spines; up to 5 nodal spines, 1/3-1/2 inch long; bark - gray and smooth.

Leaves: Cordate - deeply 5 lobed 2/3-3/4 of their length; about 1 inch broad; coarsely toothed; glandular hairy on both sides.

Flowers: Axillary racemes (4-7 flowered); sepals ovate and spreading - yellowish green to pinkish; petals only 1/2 as long as the sepals - pinkish to purplish; yellow stamens equalling the petals in length (Flowers: June - August).

Fruit: Ovoid berry (1/3 inch long); reddish-orange; glandular; palatable.



Buffaloberry

Shepherdia canadensis

Family - Elaeagnaceae

SHCA

Range: Widespread in the northern United States.

Habitat: Occurs in mid to upper elevation forest sites.

Look Alikes: Snowberries (*Symphoricarpos* spp.) and honeysuckles (*Lonicera* spp.) also have opposite leaves, but the rusty-brown scales on lower leaf surface of buffaloberry are diagnostic.

Indicator Value: Common associate in the limber pine plant community type (PIFL/JUCO6).

Miscellany: A nitrogen-fixing plant. Another common name is "soapberry." The crushed berries mixed in water create a soapy froth which Native Americans sipped as a drink. Berries are tart; but with sugar added make a good jelly. Unpalatable plant. Attractive - especially in fruit.



Buffaloberry

Shepherdia canadensis

SHCA

Habit: A spreading, deciduous low to medium shrub, 3-6 feet tall.

Stems and Bark: Young stems - reddish brown scales cover stem; older stems - brownish.

Leaves: Opposite, deciduous, ovate, 1-2 inches long, entire margin. Upper surface is dark green; lower surface is whitish with rusty-brown scales spotted throughout.

Flowers: Small, yellow, 1-several in leaf axils; appear with or before leaves; plants are dioecious (male and female flowers on separate plants) (Flowers: May - June).

Fruit: Yellowish-red translucent drupe 1/4 inch.



Birchleaf Spiraea

Spiraea betulifolia (old-lucida)

SPBE2

Family - Rosaceae

Range: South in Cascades to north central Oregon and eastward to Rocky Mountains.

Habitat: Warm, dry sites beneath ponderosa pine and Douglas-fir with occurrence on warm, moist sites beneath successional grand fir.

Look Alikes: Hawthornes (*Crataegus* spp.) are armed and have leaves that are serrated from mid point to apex. Serviceberry (*Amelanchier* spp.) leaves are darker green, with coarse serrations above the mid point of the leaf, and with a distinctive paralleling venation.

Indicator Value: Found commonly in early seral stages of grand fir plant associations under lodgepole pine; late seral stages of steep-slope, open canopy grand fir/big huckleberry (ABGR/VAME) and subalpine fir/big huckleberry (ABLA/VAME) plant associations.

Miscellany: Low in palatability - increases with disturbance (skidding, overgrazing). Plant used by Native Americans for tea. Also called shiny-leaf spiraea.



Birchleaf Spiraea

Spiraea betulifolia

SPBE2

Habit: Low rhizomatous shrub, 8-24 inches tall; forms patches with other rhizomatous plants (snowberry, ninebark, pinegrass, elk sedge).

Stems and Bark: Erect, light yellow-brown coloration is distinctive.

Leaves: Alternate, deciduous, ovate, 1-3 inches long. Green above and paler below; coarsely double serrate from mid margin to apex.

Flowers: Small, white; borne in a dense flat-topped corymb up to 4 inches across (Flowers: June - July).

Fruit: Glabrous follicles (5 in a cluster).



Mountain Snowberry

Symphoricarpos oreophilus

Family - Caprifoliaceae

SYOR2

Range: East of the Cascades to the Rocky Mountains and south to Mexico.

Habitat: Warm, dry sites at the forest edge under Great Basin climatic influence.

Look Alikes: Common snowberry (*Symphoricarpos albus*) has nontubular flowers and hollow pith. Utah honeysuckle (*Lonicera utahensis*) has larger leaves and a solid white pith.

Indicator Value: Type indicator for mountain snowberry communities (SYOR2, PSME/ACGL-SYOR2, PSME/SYOR2/CAGE2, ARTRV-SYOR2/BRCA5). Common also in the ARTRV/CAGE2 plant association and in the PIFL/JUOC plant community type.

Miscellany: Fruits are poisonous. Plant is moderately palatable and adds to a diversity of shrub, grass, forb species at the forest edge. Shape, color of foliage, and fall fruits give good horticultural attributes.



Mountain Snowberry

Symphoricarpos oreophilus

SYOR2

Habit: Erect, nonrhizomatous, mid-sized shrub, 2-5 feet tall; separated spatially as solitary individuals; vasselike form.

Stems and Bark: Young twigs - densely short hairy; old twigs - brownish, solid dark pith.

Leaves: Opposite, deciduous, elliptic-ovate, somewhat rhombic, 3/4-1 inch long; dark green (glaucous blue-green at edge of the Great Basin).

Flowers: White to pinkish; elongate corolla tube longer than lobes; trumpet-like (Flowers: June - August).

Fruit: Elliptic white fruits, 1/4-1/2 inch, persisting into winter.



Big Huckleberry

Vaccinium membranaceum

VAME

Family - Ericaceae

Range: Throughout the mountainous Pacific Northwest.

Habitat: Moist, cool forested montane environments at mid to upper elevations.

Look Alikes: Blue huckleberry (*Vaccinium globulare*) - has leaves with rounded tip and smaller leaves. There is intergradation between big huckleberry and blue huckleberry in the Wallowa and Seven Devils Mountains. They are considered ecologically equivalent.

Indicator Value: The most constant plant throughout all grand fir and subalpine fir plant associations of northern Blue and Wallowa Mountains. An excellent definer of true fir site potential in the northern Blues and Wallowas. Indicates acidic soils. Type indicator of subalpine fir/big huckleberry (ABLA/VAME), grand fir/big huckleberry (ABGR/VAME), and mountain hemlock/big huckleberry (TSME/VAME) plant associations. Commonly found also in ABLA/VASC, ABLA/ARCO9, and ABLA-PIEN/MEFE plant communities.

Miscellany: Berries are the primary native fruit occurring in the Blue and Wallowa Mountains. Excellent eaten raw, cooked in pies, pancakes, and as cobblers. YUM! Hedged by deer and elk in thermal cover areas. Unpalatable to cattle. Major summer gathering food of the Nez Perce. The staple late summer food for black bear.



Big Huckleberry

Vaccinium membranaceum

VAME

Habit: Erect, rhizomatous low shrub, 1-3 feet tall.

Stems and Bark: Young twigs - yellowish green and angled; older twigs - grayish with shredding bark; buds pointed and tightly appressed or sunken in stem.

Leaves: Alternate, deciduous; thin, ovate with acuminate tip, serrated margin; 1-2 inches long.

Flowers: Urn-shaped yellowish-pink; corolla longer than broad, 1/8 inch long (Flowers: May - June).

Fruit: Purple to dark purplish red berry, 1/4-1/2 inch broad depending on year and site. Absolutely delicious taste.



Grouse Huckleberry

Vaccinium scoparium

Family - Ericaceae

Range: Cascades east to Rocky Mountains.

Habitat: High elevation sites with heavy snowpack; cold and dry. Also occurs at lower elevations due to cold air ponding and drainageways.

Look Alikes: Not easily confused in northeastern Oregon with other huckleberries. Dwarf huckleberry (*Vaccinium myrtillus*) has larger leaves, fewer branches, bluish to dark red berry.

Indicator Value: The most common shrub in the subalpine zone. Covers many subalpine acres associated with lodgepole pine and subalpine fir. Indicator species for many plant community types and plant associations - whitebark pine (PIAL/VASC/LUHI4, PIAL/VASC/ARCO9, PIAL/VASC/ARAC2); subalpine fir (ABLA-PIAL/VASC/CARO5, ABLA-PIAL/VASC-PHEM, ABLA/VASC, ABLA/VASC-PHEM, ABLA-PIAL/VASC/ARAC2, ABLA/VASC/ARCO9, ABLA-PIEN/VASC/PHEM); and mountain hemlock (TSME/VASC).

Miscellany: Berries are sweet but small; edible raw or cooked. Plant unpalatable and little browsed. Birds and animals readily use fruits.



Grouse Huckleberry

Vaccinium scoparium

VASC

Habit: Low, deciduous shrub up to 10 inches tall.

Stems and Bark: Many slender upright stems appearing broom-like; strongly angled; yellow-green; buds pointed and tightly appressed or sunken in stem.

Leaves: Alternate, deciduous, small, 1/2 inch long; narrow, shiny light green upper surface; finely serrate margins.

Flowers: Pinkish, urn-shaped, small (Flowers: June - August).

Fruit: Small, 1/5 inch, bright red berries.



Bearded Wheatgrass

Agropyron caninum

Family - Gramineae

AGCA2

Range: Common throughout the United States from lowland elevations to the subalpine.

Habitat: Streambanks, dry slopes, ridgetops in a broad array of soils.

Look Alikes: Other wheatgrasses. Can be differentiated as follows: bluebunch wheatgrass (*A. spicatum*) - spikelets not overlapping (as long as internodes); intermediate wheatgrass (*A. intermedium*) - unawned; pubescent wheatgrass (*A. trichophorum*) - bluish cast; felt-like pubescence; blue wildrye (*Elymus glaucus*) - has two spikelets per node.

Indicator Value: A principal associate of green fescue communities in the Wallowa Mountains. Type indicator for green fescue-bearded wheatgrass (FEVI-AGCA2) communities. Prominent in mid seral stands of the green fescue/spurred lupine (FEVI-LULA3) plant association. Also occurs in alpine turf communities.

Miscellany: A very good forage for sheep, elk, and cattle but has a low tolerance to grazing pressures. Ground squirrels use seeds.



Bearded Wheatgrass

Agropyron caninum

AGCA2

Habit: Strongly caespitose perennial. Non-rhizomatous.

Leaves: Blades flat; scabrous (short hairy); culms 20-36 inches tall.

Inflorescence: Spike compact with overlapping sessile spikelets on rachis, 1.5-6 inches long; spikelets one per node, 1/2-3/4 inch long; 4-5 flowered; glumes acute-tipped to awned; lemmas awned to awnless (awn 5-25 mm long - straight or bent) (Flowers: June - August).



Bluebunch Wheatgrass

Agropyron spicatum

Family - Gramineae

AGSP

Range: Alaska to California, east to the Dakotas and New Mexico. Widespread east of the Cascades.

Habitat: Hot, dry slopes in grasslands to warm, dry forest fringe. Occurs on shallow soil scablands where roots penetrate fissures in bedrock to tap moisture. Optimum growth occurs on deeper soil sites. Under ponderosa pine, plants are widely spaced on shallow soils.

Look Alikes: Other wheatgrasses: bearded wheatgrass (*A. caninum*) - spikelets crowded; intermediate wheatgrass (*A. intermedium*) - unawned; pubescent wheatgrass (*A. trichophorum*) - short pubescent, bluish cast; blue wildrye (*Elymus glaucus*) - two sessile spikelets per node.

Indicator Value: Co-dominant with Idaho fescue in many subalpine shrubland and grassland communities where Idaho fescue occurs. Type indicator with Idaho fescue for ARTRV/FEID-AGSP, ARAR8/FEID-AGSP, CELE3/FEID-AGSP, FEID-AGSP-CYTEF, and FEID-AGSP/FRALC2 plant associations. Also common in ARTRV/CAGE2 plant association.

Miscellany: Highly palatable and nutritious. Very common and abundant in the National Forests of the Blue and Wallowa Mountains. Our greatest producer of AUM's (most dry weight per acre produced by any native grass in northeast Oregon). Resists drought well. Also high in palatability and nutritious value after curing in fall and winter months. Used extensively by cattle, horses, elk, and to a lesser degree by sheep.



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Bluebunch Wheatgrass

Agropyron spicatum

AGSP

Habit: Perennial, usually caespitose (bunch-forming) but may exhibit rhizomatous tendencies at higher elevations on warm, moist sites (especially with Idaho fescue); leafage usually 12-16 inches tall; culms up to 3 feet tall.

Leaves: Flat to slightly inrolled blades; prominently veined on upper surface; bluish appearance; auricle at leaf base on culm - reddish to purplish. Slight pubescence on under surface. Some plants that are hairy above and below on leaves and culms trend toward variety *pubescens*.

Inflorescence: Erect spike, 3-6 inches long; spikelets - one per node, 1/2-3/4 inch long; florets 6-8; glumes-acute to acuminate; lemma-awned (divergent) up to 3/4 inch long (Flowers: June - August).



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Mountain Brome

Bromus carinatus

Family - Gramineae

Range: Alaska to Baja California; east to Alberta, the Dakotas, Wyoming, Colorado, and New Mexico.

Habitat: Warm, dry forested communities at low to mid elevations in the mountains. Also occurs with subalpine big sagebrush at mid to high elevations.

Look Alikes: Smooth brome (*B. inermis*) - spikelets not compound, lemma not keeled; Columbia brome (*B. vulgaris*) - lax, drooping.

Indicator Value: Commonly occurs with mountain big sagebrush and mountain snowberry. Type indicator for ARTRV/BRCA5, ARTRV-SYOR2/BRCA5, and CAHO5-BRCA5 plant community types. Common in ARTRV/CAGE2, ARTRV/FEID-AGSP, ARTRV/FEVI, FEID/CAHO5, FEVI-CAHO5, and FEVI-LULA3 communities. In forest stands it occurs in the PIAL/RIMO2/POPU3 plant association, several subalpine fir associations (ABLA/VASC), and in alpine fleecflower cornice communities.

Miscellany: Native Americans ground seed into meal. Resists grazing pressure and drought well. Palatable to all classes of livestock early in the growing season. Cattle and horses relish seedheads. Indicates overgrazing and soil disturbance by forming dense stands. Pocket gophers use the plant preferentially. Also known as "California brome."



Mountain Brome

Bromus carinatus

BRCA5

Habit: Perennial, fibrous roots, culms 12-40 inches tall; culms hairy - especially near the base.

Leaves: Flat, up to 1/2 inch wide; glabrous to hairy.

Inflorescence: Narrow panicle, 4-10 inches long; spikelet, 3/4-1 inch long, strongly compressed; 5-10 florets per spikelet; glumes and lemmas keeled; lemmas awned (straight), up to 3/4 inch long (Flowers: May - August).



Columbia Brome

Bromus vulgaris

Family - Gramineae

BRVU

Range: British Columbia to Sierras of California; east to Montana and Wyoming.

Habitat: Under firs on cool, moist forested sites at mid to upper elevations.

Look Alikes: Fairly distinctive appearance; the only native brome beneath true firs; smooth brome (*B. inermis*) is rhizomatous.

Indicator Value: Occurs beneath true fir trees in cool, moist plant associations. Common in ABLA-PIEN/CLUN2, ABLA-PIEN/ARCO9, ABLA/VAME, and ABGR/VAME plant associations.

Miscellany: Native Americans used brome seeds for meal. Plant is used lightly by grazing animals. Palatable.



Columbia Brome

Bromus vulgaris

BRVU

Habit: Perennial, non-rhizomatous; leafage usually 18-24 inches tall; culms up to 3 feet tall; often patch-forming.

Leaves: Drooping appearance, flat, 3/8 inch wide; glabrous to hairy on both surfaces. No auricles.

Inflorescence: Open panicle, 4-7 inches long; nodding or drooping. Spikelets about 1 inch long; more than 2 florets per spikelet; lemma awned, 1/8-1/4 inch long (Flowers: June - August).



Pinegrass

Calamagrostis rubescens

CARU

Family - Gramineae

Range: British Columbia south in Cascades to southern California; throughout Pacific Northwest and south in Rockies to Colorado.

Habitat: Warm, dry to cool, dry sites beneath ponderosa pine, Douglas-fir, lodgepole pine, and larch at mid elevations.

Look Alikes: Elk sedge (*Carex geyeri*) - all leaves basal, dark green, coarse; 3-ranked; triangular stem; inflorescence a brown cigar-like spike.

Indicator Value: Indicative of fire disturbance. Type indicator for ABLA/CARU, ABGR/CARU, and PSME/CARU plant associations. Common in ABLA/ARCO9, ABLA/VAME, and ABLA/VASC plant associations.

Miscellany: Pinegrass resists fire. Palatability of pinegrass improves following burning. Seedstalks infrequent; abundant the year following fire. Forms dense mats resisting tree establishment. Very aggressive and competitive. Lightly used for forage except in spring when succulent and in fall when rains and frosts soften the leaves. The specific name "rubescens" refers to reddish cast of culm bases.



Pinegrass

Calamagrostis rubescens

CARU

Habit: Perennial, strongly rhizomatous grass; culm bases are reddish; leafage usually 12-16 inches tall; culms up to 3 feet tall.

Leaves: Flat, drooping blades, 1/8 inch wide; mostly basally arranged; auricles lacking; collar of conspicuous hairs is diagnostic.

Inflorescence: Seldom flowers; spikelike panicle, 3-6 inches long; one floret per spikelet; awn twisted and bent - attached near base of lemma and extending slightly longer than spikelet (Flowers: late June - August).



Timber Oatgrass

Danthonia intermedia

DAIN

Family - Gramineae

Range: Alaska to California; eastward through the mountainous west.

Habitat: Rocky and gravelly grasslands; dry meadows; along streams and lakeshores. Alpine ridges above treeline on fellfields and margins of Krummholz.

Look Alikes: Differentiate from other oatgrasses as follows: California oatgrass (*Danthonia californica*) - taller; open panicle of only 2-4 spikelets. Onespice oatgrass (*Danthonia unispicata*) - hairy culms; shorter (up to 12 inches tall).

Indicator Value: Type indicator for Idaho fescue - timber oatgrass - Liddon's sedge (FEID-DAIN-CAPE7) plant association. Increases with disturbance by ungulate overuse of subalpine rangelands. An associate with Hood's sedge (CAHO5-BRCA5, CAHO5-CAGE2, and FEID-CAHO5) and green fescue communities.

Miscellany: Initiates growth early before many other associated plants. Provides spring forage for all ungulates. Palatability is good on spring foliage. Basal meristems provide regrowth after heavy utilization. Reproduces by seed and tillering. Increases on overgrazed rangelands. Dominant on depleted rangelands due to low midsummer palatability for ungulates. Moderately resistant to fire. Mountain goats use timber oatgrass above treeline.



Timber Oatgrass

Danthonia intermedia

DAIN

Habit: Perennial, caespitose (bunch-forming), up to 20 inches tall; roots fibrous to a shallow depth.

Leaves: Flat to involute, about 1/8 inch wide; ascending, mostly basal, hairy on lower surface but smooth on upper surface. Culms glabrous but with tufted hairs where leaf blade meets the culm.

Inflorescence: Narrow, one-sided, spike-like purplish panicle, 1-2.5 inches long, with 4-12 ascending branches (each branch with 1-2 spikelets). Spikelets 3-6 flowered, about 1/2 inch long; glumes subequal and longer than upper most floret; lemma awned between teeth. Awn twisted, about 1/2 inch long (Flowers: July - August).



Idaho Fescue

Festuca idahoensis

Family - Gramineae

Range: British Columbia southward in Olympics and Cascades to Sierras and eastward to the Rockies.

Habitat: Warm, dry to warm, moist grasslands (often associated with bluebunch wheatgrass on drier sites) and extending with prairie junegrass into the ponderosa pine forested fringe.

Look Alikes: Other fescues: *Festuca occidentalis* (leaves light green, shorter; panicle open and drooping); *F. scabrella* (unawned); *F. ovina* (panicle congested; foliage yellow-green); *F. viridula* (blades flat).

Indicator Value: Idaho fescue is the cool, moist grass of the subalpine in the Blue Mountains. Type indicator for FEID-AGSP/CYTEF and FEID-AGSP-FRALC2 plant associations. In the Seven Devils it is type indicator for FEID-DAIN-CAREX and FEID-CAHO5 plant associations. In the Wallowas it is type indicator for FEID-GETR, FEID-KOCR, and FEID-PESP2 plant community types.

Miscellany: Our second most common and important grass in the Blue and Wallowa Mountains. Has a wide ecologic amplitude (canyon north slopes at 1,000 feet elevation to subalpine ridges at 8,200 feet elevation). Palatability varies (relished by elk, sheep, and cattle in canyons in spring; little used in summer in high mountain areas). Palatability increases from south to north in Blue Mountains. Once called "blue bunchgrass" from color of leaves.



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FEID

Idaho Fescue

Festuca idahoensis

FEID

Habit: Strongly caespitose perennial; non-rhizomatous; foliage only 3-10 inches tall; culms up to 2.5 feet tall.

Leaves: Basal, fine, 2-5 inches long; green to bluish cast; tightly inrolled blades; no auricles.

Inflorescence: Narrow panicle, 3-6 inches long; erect and ascending spikelets; 5-7 florets per spikelet; lemma with stout, straight, short awn, 1/8 inch (Flowers: May - July).



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Green Fescue

Festuca viridula

Family - Gramineae

Range: British Columbia to California; across Canada to Alberta; south in Rockies to Montana and Idaho. Occurs in high elevations of Wallowa Mountains in Oregon.

Habitat: Subalpine forest openings, grassy alpine and subalpine slopes and ridges and in whitebark pine savanna on cold, dry and cool, moist well-drained soils.

Look Alikes: *F. idahoensis* (blades inrolled; bluish cast; narrow panicle); *F. scabrella* (lower elevations; blades inrolled); *F. ovina* (panicle congested; blades inrolled).

Indicator Value: Indicative of whitebark pine and subalpine fir zones in the Wallowa Mountains. Type indicator for all green fescue plant associations, plant community types, and plant communities. Also type indicator for ABLA/FEVI, ABLA-PIAL/FEVI, ARTRV/FEVI and PIAL/FEVI plant community types.

Miscellany: Provides valuable sod cover to fragile high elevation sites. Degradation of green fescue communities results in rapid and severe

erosion of soils. Very palatable to sheep and cattle. Ranks with bluebunch wheatgrass and timothy as one of most nutritious of grasses.



FEVI

Green Fescue

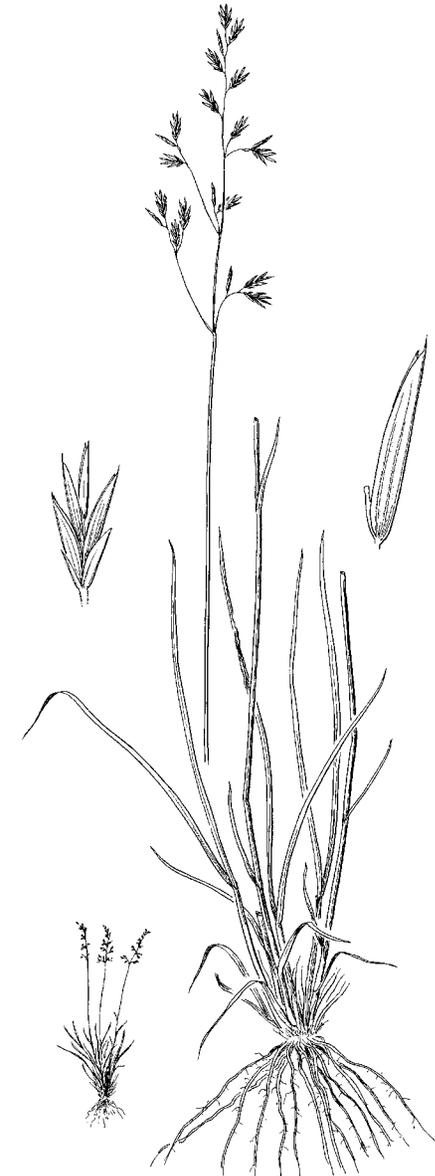
Festuca viridula

FEVI

Habit: Densely caespitose perennial; foliage 6-12 inches tall; culms 16-32 inches tall; extensive fibrous roots bind soil to 3 foot depth or greater.

Leaves: Flat blades, up to 1/8 inch wide; green; no auricles.

Inflorescence: Open panicle, 2.5-6 inches long; spikelets, 3/8-1/2 inch long; 3-6 florets per spikelet; lemma awnless or minutely awned (Flowers: June - July).



Prairie Junegrass

Koeleria cristata

Family - Gramineae

Range: British Columbia south throughout much of the United States.

Habitat: Variable with wide amplitude. Strong fidelity with Idaho fescue on upper canyon slopes and grassy ridges on warm, dry sites. Occurs at higher montane elevations on well drained soils.

Look Alikes: *Poa* spp. (bluegrass) - parallel grooves on upper leaf surface; keeled leaf apex; *Phleum* spp. (timothy) - spikelet 1-flowered; glumes ciliate on keel; *Trisetum spicatum* (spike trisetum) - lemma with bent awn.

Indicator Value: Indicator of the Idaho fescue-prairie junegrass (FEID-KOCR) plant association. Commonly found beneath mountain big sagebrush plant associations (ARTRV/CAGE2, ARTRV/FEID-AGSP); and the ARTRV/FEVI plant community type.

Miscellany: Occurs as scattered individuals rather than in pure stands. Used early by all livestock, but provides minor component of forage intake due to plant size.



Prairie Junegrass

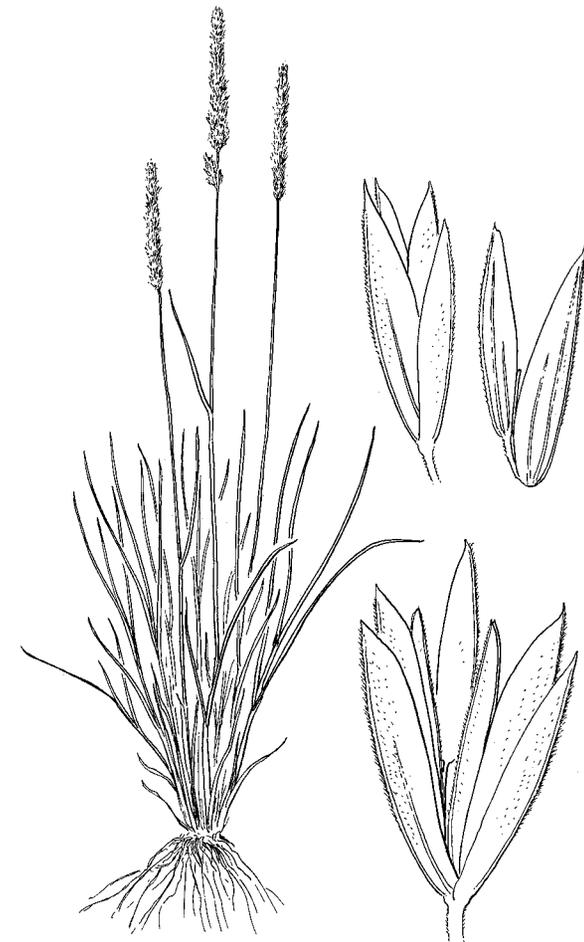
Koeleria cristata

KOCR

Habit: Caespitose perennial, densely tufted; culms 1-2 feet tall, often downy.

Leaves: Flat (sometimes folded), 1/8 inch wide; deeply grooved parallel to midvein on top surface; margins hairy; no auricles.

Inflorescence: Dense spike-like panicle, 2-5 inches long; silvery (shining); spikelets 2-4 flowered; lemma awnless to awn-tipped (Flowers: May - July).



Oniongrass

Melica bulbosa

Family - Gramineae

Range: British Columbia to California; eastward to Montana, Wyoming, and Colorado.

Habitat: Mountain big sagebrush slopes and open coniferous forests from mid to subalpine elevations (up to 8000 feet in Wallowa Mountains). Favors moist, rich sandy loams or clay loams.

Look Alikes: Purple oniongrass (*Melica spectabilis*) - long, curled panicle branches; culms not clustered. Alaska oniongrass (*Melica subulata*) - acuminate lemma tips.

Indicator Value: Type indicator for oniongrass-western needlegrass (MEBU-STOC2) communities and is found with green fescue (FEVI-LULA3, FEVI-CARO5, FEVI-AGCA2), mountain big sagebrush (ARTRV/LINU4, ARTRV/FEVI), and alpine fleecflower communities.

Miscellany: Reproduces from seeds (low viability) and tillers from the bulbous culm bases. Good forage for livestock, deer, and elk; but generally not abundant and yielding little productivity.



MEBU

Oniongrass

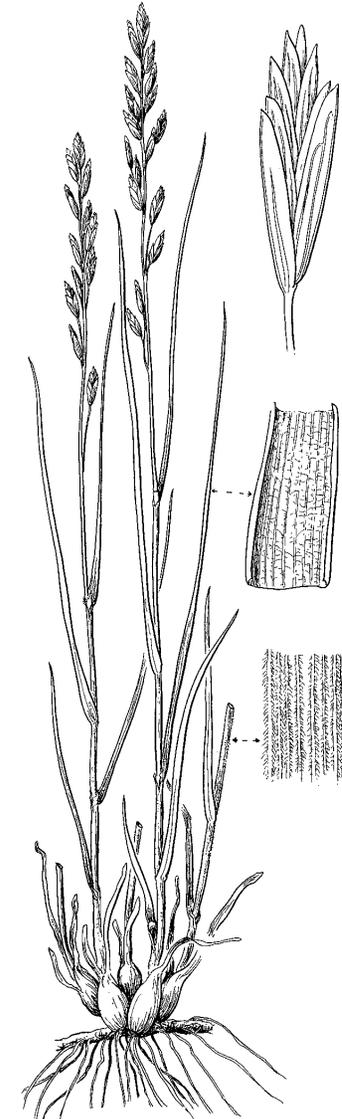
Melica bulbosa

MEBU

Habit: Perennial bunchgrass; culms up to 40 inches tall; bulbous-based culms clustered on short rhizomes; stems usually bent near the base.

Leaves: Flat to involute, 12 inches long - 3/16 inch wide; mostly glabrous.

Inflorescence: Panicle, 8 inches long, purplish, narrow and elongate; spikelets on short, erect branches; spikelets 2-9 flowered; upper florets sterile; acute tipped lemmas with a purple band at the margins and at the base; unawned (Flowers: May - July).



Purple Oniongrass

Melica spectabilis

Family - Gramineae

MESP

Range: British Columbia south to northern California (east of Cascades) and eastward to Montana, Wyoming, and Colorado.

Habitat: Subalpine forest openings; grassy alpine and subalpine slopes and ridges; whitebark pine savanna on cold, dry and cool, moist well-drained soils.

Look Alikes: Other oniongrasses - *M. subulata* (lemmas acuminate); *M. fugax* (open panicle); *M. bulbosa* (culms densely clustered). *Bromus vulgaris* (droopy; open panicle-nodding; awned).

Indicator Value: Common in FEID-CAHO5, FEVI-CAHO5, and POPH communities.

Miscellany: Highly palatable for cattle, horses; average palatability for deer, elk, and sheep.



Purple Oniongrass

Melica spectabilis

MESP

Habit: Rhizomatous perennial; culms 12-32 inches tall; bulbous-based and spaced about 1 inch apart on the rhizome.

Leaves: Blades flat, 3/10 inch wide.

Inflorescence: Narrow panicle, 3-6 inches long; spikelets erect, purplish; 3-8 florets/spikelet; lemma blunt (Flowers: late May - July).



Little Ricegrass

Oryzopsis exigua
Family - Gramineae

OREX

Range: British Columbia; Washington and Oregon (east of Cascades) to Montana, Nevada, Utah, and Colorado.

Habitat: Open gravelly or rocky slopes, ledges, cliffs, ridges, and dry meadows to near treeline in subalpine.

Look Alikes: Needlegrasses have double-twisted awns bent in 2 places. Spike trisetum (*Trisetum spicatum*) - awned from back of lemma; florets - 2 per spikelet.

Indicator Value: Defines the subalpine fir-whitebark pine/grouse huckleberry/little ricegrass (ABLA-PIAL/VASC/OREX) community on ridgetop granitic outcrops in the Wallowa Mountains. Also a component of other subalpine fir-whitebark pine (ABLA-PIAL/VASC, ABLA-PIAL/FEVI) plant communities.



Little Ricegrass

Oryzopsis exigua

OREX

Habit: Perennial bunchgrass; culms densely tufted, up to 12 inches tall.

Leaves: Blades involute to filiform; stiffly erect, 4 inches long.

Inflorescence: Panicle - narrow, about 3 inches long; spike-like; florets 1 per spikelet; lemma with a stout, bent awn, 3/16 inch long located between the 2-toothed tip (Flowers: late June - August).



Cusick's Bluegrass

Poa cusickii

Family - Gramineae

POCU3

Range: Alberta and Saskatchewan; central Washington east to Idaho and western Montana; south to northern Nevada and central California.

Habitat: Fellfields; alpine ledges and ridges, rocky slopes, and meadows.

Look Alikes: Other awnless high elevation grasses with congested spike-like panicles. Oniongrasses - (*Melica* spp.) - culms bulbous-based; leaves flat. Sandberg's bluegrass (*Poa sandbergii*) - basal leaves 1-2 inches long.

Indicator Value: *Poa cusickii* var. *cusickii* (POCUC) is found in the subalpine in big sagebrush communities (i.e., ARTRV/FEID-AGSP) and as a type indicator for the CAGE2-POCU3 community. *Poa cusickii* var. *epilis* (POCUE) tends to occupy higher elevation sites with Idaho fescue (FEID-CAHO5 pct; FEID-PESP2 pct) and green fescue (FEVI-LULA3 and FEVI-JUPA plant associations; FEVI-PENST plant community type; FEVI-CASC12 communities). Subalpine fir-whitebark pine plant communities often contain *Poa cusickii* var. *epilis*.

Miscellany: Named for William C. Cusick (1842-1922) - pioneer botanist in the Wallowa and Blue Mountains. This bluegrass develops early in growing season and is used by deer and elk in early summer. Vulnerable to overgrazing early in the season. Reproduces from seed and by tillering.



Cusick's Bluegrass

Poa cusickii

POCU3

Habit: Perennial bunchgrass. Culms densely clustered, up to 20 inches tall; fibrous roots.

Leaves: Abundant, mostly basal, inrolled, erect, 2.5-8 inches long; culm leaves 2-3, flat or folded, less than 2.5 inches long.

Inflorescence: *Poa cusickii* var. *cusickii* - panicle narrow, 1-4 inches long; brownish to purplish, branches ascending. Spikelet - strongly compressed, 3/8 inch long. Lemmas, 5 nerved; pale purplish tinge at middle; keeled.

Poa cusickii var. *epilis* - panicle ovoid, 1-2.5 inches long, purple in color, branches not spreading. Spikelet, 3/8 inch long; strongly compressed. Lemmas, 5 nerved; purple; keeled.

(Flowers: July - August).



Wheeler's Bluegrass

Poa nervosa var. *wheeleri*

Family - Gramineae

Range: Widespread in the western United States.

Habitat: Commonly occurs beneath older ponderosa pine and Douglas-fir at their bases.

Look Alikes: Other *Poa* species (PONEW - spikelets flattened; rhizomatous; lemma not cob-webby).

Indicator Value: A strong affinity with prickly sandwort in the following communities: ABLA/ARNE/ARAC2, ABLA-PIAL/ARAC2, PIAL/ARAC2. Common in ARTRV/CAGE2 and PSME/ARNE/CAGE2 plant associations.

Miscellany: Low in palatability. Plants are scattered and have sparse foliage.



PONEW

Wheeler's Bluegrass

Poa nervosa var. *wheeleri*

PONEW

Habit: Rhizomatous perennial, tufted; culms, 12-30 inches tall; lower sheaths reddish-purple.

Leaves: Flat to folded, 1/16 inch wide; tips prow-shaped.

Inflorescence: Small panicle, 2-4 inches long; loose; rachilla branches drooping to ascending; spikelets, 1/4-1/2 inch long; 4-7 florets per spikelet; lemma not webbed at base; strongly keeled (Flowers: April - August).



Sandberg's Bluegrass

Poa sandbergii

Family - Gramineae

POSA12

Range: Alaska to British Columbia and Saskatchewan throughout Pacific Northwest to California, Nevada, northern Arizona, New Mexico and east to Nebraska.

Habitat: Relatively dry grasslands, scablands, and in drier shrublands across a wide variety of climatic, edaphic, and elevational extremes.

Look Alikes: Other bluegrasses: Wheeler's bluegrass (*P. nervosa* var. *wheeleri*) - taller (over 12 inches); rhizomatous; spikelets flattened; Kentucky bluegrass (*P. pratensis*) - blades wide and flat; rhizomatous; pine bluegrass (*P. scabrella*) - taller (over 15 inches); basal leaves longer (3-6 inches long).

Indicator Value: A strong component of all bluebunch wheatgrass plant associations (except where steep slopes and surface movement preclude its establishment). Found in Idaho fescue-bluebunch wheatgrass plant associations (ARTRV/FEID-AGSP, ARAR/FEID-AGSP, FEID-AGSP-CYTEF, and FEID-AGSP-FRALC2). Also occurs in alpine fellfield communities.

Miscellany: Important forage species in spring and fall when rains promote rapid vegetative growth before and after development of the primary bunchgrasses. Root system with deeply penetrating fibrous roots make it an effective soil binder. Highly resistant to summer drought (goes dormant) and fire.



Sandberg's Bluegrass

Poa sandbergii

POSA12

Habit: Perennial bunchgrass. Densely tufted with early withering leaves. Often purplish tinged from strong sunlight exposure and dry sites. Culms, 4-12 inches tall are erect and wiry.

Leaves: Usually only 1 or 2 on the culm - the rest basal. Blades flat, folded, or inrolled, 1-2 inches long. Leaf tip boat-shaped; double midrib grooves on upper leaf surface. Basal leaves usually 1-3 inches long.

Inflorescence: Panicle, 2-4 inches long; narrow or open - not dense. Panicle branches ascending. Spikelets only 4-6 mm long; 2-4 flowered; rounded and pointed; lemma purplish-tinged with short hairs at base; unawned (Flowers: April - June).



Bottlebrush Squirreltail

Sitanion hystrix

Family - Gramineae

SIHY

Range: British Columbia to Alberta; southward to southern California, Arizona, New Mexico, Texas, Oklahoma. From sea level to subalpine and alpine locations. The variety *S. hystrix hordeoides* occurs on scablands in the Inland Pacific Northwest, northern Nevada and northern California.

Habitat: Dry, exposed sites in plains, valleys, foothills, mountains. Abundant on disturbed sites.

Look Alikes: Very distinctive but may be confused with the following: red threeawn (*Aristida longiseta*) - only one spikelet per node; awns three-parted; foxtail barley (*Hordeum jubatum*) - 3 spikelets per node; nodding inflorescence; purplish; dwarf bottlebrush squirreltail (*S. hystrix* var. *hordeoides*) - plants usually less than 12 inches tall.

Indicator Value: Disturbances. Increaser on subalpine rangelands from overgrazing. Typical indicator for the disturbance community type (STOC2-SIHY) in the Strawberry and Elkhorn Mountains. Also a common component of a broad range of plant community types in subalpine forests (ABLA/CAGE2, ABLA/VASC, PIAL/CAGE2, PIAL/RIMO2/POPU3); shrublands (ARTRV/CAGE2, ARTRV/FEID-AGSP); grasslands (FEID-CAHO5, FEVI-LULA3); and forbfields (POPH). Also found in fellfields and scree communities.

Miscellany: Provides good forage before development of seedheads.

Unpalatable in mid summer due to awns, but can provide fall and winter forage after awns dislodge. The loosely clustered culms burn rapidly in a fire with little heat transferred to the crown; thus the species is one of the most fire-resistant bunchgrasses.



Photo by Karl Urban

Bottlebrush Squirreltail

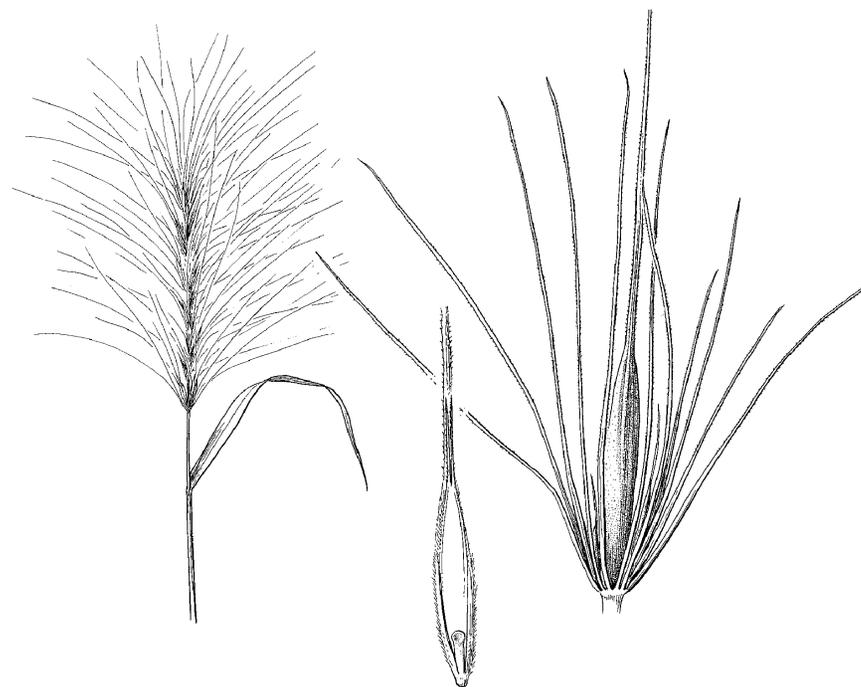
Sitanion hystrix

SIHY

Habit: Perennial bunchgrass, 12-24 inches tall; culms stiff; usually hairless.

Leaves: Blades flat, folded, or inrolled, 2-8 inches long; auricles small or lacking.

Inflorescence: Erect spike, 1-6 inches long, with 2 spikelets per node. Spikelets 2-3 per node; 1-6 flowered; glumes extend to long awns, 1-4 inches long; lemmas with an extended awn, up to 8 inches long, and spreading widely into a "bottlebrush" (Flowers: May - July).



Lemmon's Needlegrass

Stipa lemmonii

Family - Gramineae

Range: British Columbia; Washington, Oregon & California - east of the Cascades and Sierras; east to northern Idaho and southwest Montana; western Nevada to Arizona.

Habitat: Found on ridges and upper slopes growing in volcanic sandstone - derived soils and on rocky-gravelly soils of the Clover Creek greenstones in the southern Wallows.

Look Alikes: Other needlegrasses - Needle and thread grass (*S. comata*) - awn over 4 inches long. Letterman's needlegrass (*S. lettermanii*) - awn less than 3/4 inch long. Spike trisetum (*T. spicatum*) - awn located on back of lemma. Little ricegrass (*O. exigua*) - short awn bent once.

Indicator Value: Type indicator for the subalpine fir-whitebark pine/Parry's rush - Lemmon's needlegrass (ABLA-PIAL/JUPA-STLE2) plant association.



Lemmon's Needlegrass

Stipa lemmonii

STLE2

Habit: Perennial bunchgrass; culms up to 30 inches tall.

Leaves: Blades involute, less than 1/8 inch wide.

Inflorescence: Panicle-narrow, 6 inches long, spike-like, erect; lemma with double-twisted subterminal awn, about 3/4-1 inch long (Flowers: May - July).



Western Needlegrass

Stipa occidentalis

Family - Gramineae

Range: British Columbia to southern California; eastward to the Dakotas and south to southwest Texas.

Habitat: Dry grasslands in the foothills; in open mountain woodlands; and ridges at high elevations of the subalpine.

Look Alikes: Possibly could be confused with bluebunch wheatgrass (*Agropyron spicatum*) - awned spikelets aligned on a spike; spike trisetum (*Trisetum spicatum*) - glumes envelope 2 florets; each floret awned from back but bent just once. Other needlegrasses: needle and thread (*S. comata*) - awn over 4 inches long; Lemmon's needlegrass (*S. lemmonii*) - subterminal awn; Letterman's needlegrass (*S. lettermanii*) - awn less than 3/4 inch long; glabrous.

Indicator Value: Increaser, especially on former sheep ranges. Common in green fescue plant associations (FEVI-JUPA, FEVI-LULA3). Type indicator ABLA2/STOC2, FEVI-STOC2, MEBU-STOC2, and STOC2-SIHY community types. Also common in ABLA/CAGE2, ABLA-VASC, ARTRV/CAGE2, ARTRV/FEVI, CAHO5-BRCA5, FEID-CAHO5, and POPH cornice communities.



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STOC2

Miscellany: Provides fair forage for sheep, deer and elk; good forage for cattle prior to maturity of seedheads. Becomes unpalatable after maturity. Since it is avoided after maturity, it has a competitive advantage over grazed decreaser grasses (i.e., bluebunch wheatgrass, Sandberg's bluegrass). May regrow in fall with adequate moisture. Seeds are used by sparrows, lazuli buntings, and chipmunks.

Western Needlegrass

Stipa occidentalis

STOC2

Habit: Perennial bunchgrass; culms slender, 10-16 inches tall.

Leaves: Fine, inrolled leaves, 4-10 inches long.

Inflorescence: Panicle, 4-10 inches long; narrow with ascending branches; spikelets congested; lemma hairy; awned with double twist; awn bent in 2 places, approx. 1 inch long, and pubescent (Flowers: May - August).



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Spike Trisetum

Trisetum spicatum

Family - Gramineae

Range: Alaska, Canada, mountains of western U.S., Great Lakes area, Appalachian Mountains, Mexico, antarctic South America, arctic alpine Eurasia. An unusual discontinuous distribution for a species.

Habitat: Dry sandy soils on rocky slopes, open ridges, and rocky outcrops in subalpine and alpine environments.

Look Alikes: Other grasses with spike-like inflorescences. Prairie junegrass (*Koeleria cristata*) - lemma awnless; panicle silverish (shining) - not purplish. Timothy (*Phleum pratense*) - spikelet 1-flowered.

Indicator Value: Key component of Idaho fescue - Hood's sedge (FEID-CAHO5) p.c.t., and of early seral vegetation in green fescue - western needlegrass (FEVI-STOC2) communities. Also one of the principal grasses in alpine turf communities. Common in subalpine fir and whitebark pine forest communities as well.

Miscellany: Reproduces from seeds and tillers. Provides forage at higher elevations late in summer and early fall. An important forage grass for domestic and wild ungulates. Deer, bighorn sheep, and mountain goats utilize trisetum in the subalpine and alpine rangelands. Very sensitive to overgrazing pressure.



Spike Trisetum

Trisetum spicatum

TRSP2

Habit: Perennial bunchgrass; culms up to 20 inches tall; herbage usually hairy; roots fibrous.

Leaves: Blades flat or folded, 1/8 inch wide - 2-6 inches long; usually hairy.

Inflorescence: Dense spike-like bristly panicle, 1-4 inches long; purplish green, often shining silvery; spikelets 2-3 flowered; second glume longer and wider than the first; awned from below the tip (1/3) of the lemma; awn about 3/4 inch long and once-bent (Flowers: June - September).



Elk Sedge

Carex geyeri

Family - Cyperaceae

Range: Mainly east of the Cascades from British Columbia to northern California, Utah, and Colorado.

Habitat: Warm, dry lower to mid elevation forested sites to cool, dry upper elevations in subalpine of Blue Mountains.

Look Alikes: *Calamagrostis rubescens* (pinegrass) - leaves are lighter green; not basally arranged; tuft of hair at leaf collar; awned florets; reddish culm bases. Other upland sedges - leaves shorter or wider.

Indicator Value: Strongly associated and often co-dominant with pinegrass. Most frequent and abundant in southern Blue Mountains. Prominent in subalpine fir and whitebark pine savanna of the Blue Mountain crests. Type indicator for PIAL/CAGE2, ABLA-PIAL/CAGE2, ABLA2/CAGE2, ABGR/CAGE2, ARTRV/CAGE2, CAHO5-CAGE2, CELE3/CAGE2, FEID-CAGE2, PSME/ARNE/CAGE2, and PSME/SYOR2/CAGE2 communities. Also common in ABLA/ARCO9, ABLA/VAME, ABLA/VASC, and ABLA-PIAL/VASC/ARCO9 plant associations.

Miscellany: A heavy sod former. Fierce competitor with associated rhizomatous grasses and shrubs on forested sites. Withstands heavy grazing; highly drought tolerant. Moderately palatable when succulent in early season and early autumn after fall rains and frosts have softened foliage. Elk use is high in early spring.



Elk Sedge

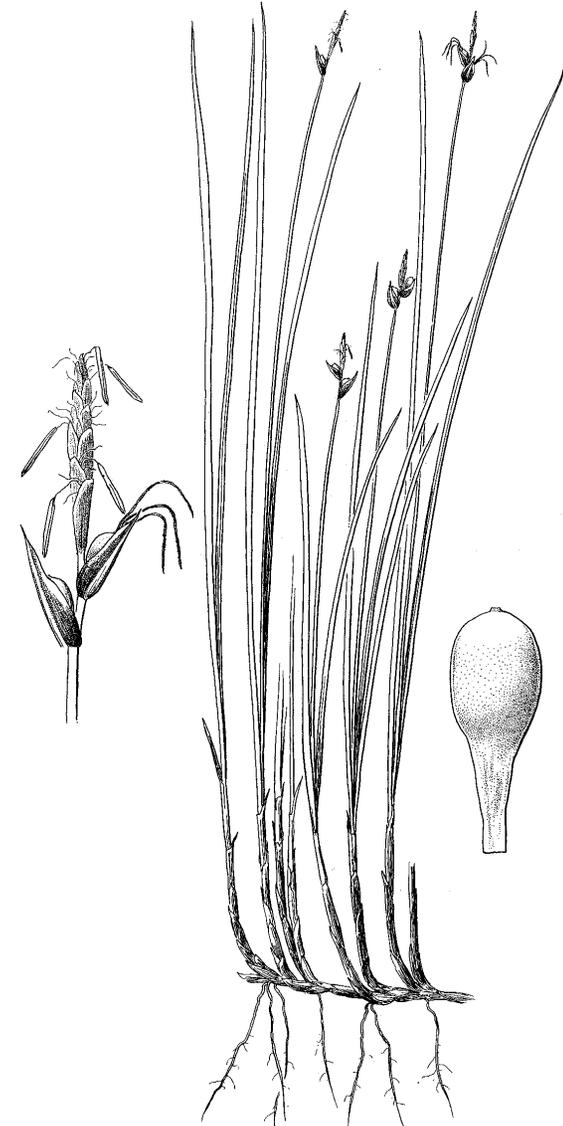
Carex geyeri

CAGE2

Habit: Loosely clustered culms from rhizomes; appearing grass-like; evergreen perennial; culms 8-20 inches tall - triangular in cross section.

Leaves: Flat, tough, evergreen; 3-ranked; brownish dried tips; basal sheathes shiny tan to brown.

Inflorescence: Solitary bractless terminal spike; 1-3 pistillate flowers with brownish scales below; fruit a large 3-angled achene (Flowers: April - July).



Hood's Sedge

Carex hoodii

Family - Cyperaceae

Range: Southwestern Canada to the Dakotas, Colorado, Nevada, Utah and California. Widespread in the Pacific Northwest.

Habitat: Widespread from foothills to subalpine in the mountains. Occurs in forest openings, in meadows and on slopes with scattered trees.

Look Alikes: Other sedges with heads or congested spikes. Differentiate on stature (1-3 ft.), habitat (upland sites), and by the scales of the flowers (brown with green midrib).

Indicator Value: Type indicator for green fescue/Hood's sedge (FEVI/CAHO5), Idaho fescue - Hood's sedge (FEID-CAHO5), and mountain big sagebrush/Hood's sedge (ARTRV/CAHO5) plant associations. Also common in ARTRV/FEVI, FEVI/JUPA, FEVI/LULA3 plant associations and alpine fleecflower (POPH) communities.

Miscellany: Sensitive to grazing pressure.



CAHO5

Hood's Sedge

Carex hoodii

CAHO5

Habit: Perennial, stems densely clustered, 12-30 inches tall.

Leaves: Elongate but shorter than the culms; blades flat and soft.

Inflorescence: Several spikes clustered in a dense cylindric head, 1/2-1 inch long such that individual spikes are difficult to see. Scales brown with a green midrib; stigmas - 2 (Flowers: May - July).



Small-winged Sedge

Carex microptera

Family - Cyperaceae

Range: British Columbia eastward in western Canada; south to California, Arizona, and New Mexico.

Habitat: Occurs on moderately wet meadows as well as drier meadows and open grasslands.

Look Alikes: Other ovalhead sedges. Hood's sedge (*Carex hoodii*) - scales that are brown with a green midrib; Liddon's sedge (*Carex petasata*) - head not flat bottomed; spikes form a lance-like head. Dunhead sedge (*Carex phaeocephala*) - channeled leaves.

Indicator Value: A common associate in the green fescue (FEVI) plant association and in other green fescue communities (FEVI-CAHO5, FEVI-CARO5, FEVI-JUPA, FEVI-PENST, FEVI-STOC2).

Miscellany: Includes *Carex festivella* in the current taxonomy. One of the most common sedges east of the Cascades in Washington and Oregon. Used by deer and elk. Provides fair forage for domestic sheep. Reproduces by seed; therefore, overgrazing will cause loss in vigor and decline. Defer use until after seed fall.



CAMI7

Small-winged Sedge

Carex microptera

CAMI7

Habit: Perennial, plants densely tufted, numerous, up to 30 inches tall, roots fibrous, no creeping rhizomes.

Leaves: Basal leaves are scales with flat upper leaves well above the plant's base, 3-5 per culm.

Inflorescence: Spikes (3-10 forming a flat-bottomed ovoid head 1/2-1 inch long); male flowers below - female flowers above; scales brown with light midrib; perigynia greenish-yellow to brownish; stigmas - 2 (Flowers: June - August).



Liddon's Sedge

Carex petasata

Family - Cyperaceae

Range: British Columbia east to Saskatchewan; south to Oregon, Nevada, Utah and Colorado.

Habitat: In grasslands and dry to wet meadows. Occurs high in elevation to treeline.

Look Alikes: Small-winged sedge (*Carex microptera*) - flat bottomed head. Hood's sedge (*Carex hoodii*) - scales brown with green midrib. Dunhead sedge (*Carex phaeocephala*) - channeled leaves.

Indicator Value: Common associate with green fescue (FEVI-CARO5, FEVI-PENST, FEVI-STOC2, FEVI-LULA3), shrubby cinquefoil (POFR4-FEID). Indicator for the FEID-DAIN-CAPE7 plant association.

Miscellany: One of the most common sedges in the Wallowa Mountains.



CAPE7

Liddon's Sedge

Carex petasata

CAPE7

Habit: Perennial, plants densely tufted up to 36 inches tall, roots fibrous, no creeping rhizomes.

Leaves: Flat and shorter than the culms.

Inflorescence: Spikes (3-6); sessile; forming a lanceolate compact head, 1-2 inches long; scales medium brown; perigynia pale greenish to brownish; stigmas - 2 (Flowers: June - July).



Dunhead Sedge

Carex phaeocephala

Family - Cyperaceae

CAPH2

Range: British Columbia south to California; Alberta south to Colorado in the Rockies.

Habitat: At treeline or above in fellfields and turf fields, talus, scree.

Look Alikes: Other ovalhead sedges. Small-winged sedge (*Carex microptera*) - flat bottomed head. Liddon's sedge (*Carex petasata*) - spikes forming lance-like head. Hood's sedge (*Carex hoodii*) - scales brown with green midrib.

Indicator Value: Perhaps the most common sedge of the alpine environments. Occurs in Idaho fescue - Wallowa penstemon (FEID-PESP2) plant community type, alpine fellfields, and turf communities.



Dunhead Sedge

Carex phaeocephala

CAPH2

Habit: Perennial, plants densely tufted up to 16 inches tall, roots fibrous, no creeping rhizomes.

Leaves: Clustered at the base; numerous; blades, stiff, flat, channeled at base, 1/8 inch wide.

Inflorescence: Spikes (3-7), sessile, densely clustered in a straw-colored head up to 1 inch long; male flowers occur below female flowers in the spike. Scales dark brown with light midrib. Perigynia straw colored to dark brown with green winged edges; stigmas - 2 (Flowers: July - August).



Ross Sedge

Carex rossii

Family - Cyperaceae

CARO5

Range: Widespread in the western mountains of the United States.

Habitat: Warm, dry, often droughty sites in upper montane and subalpine elevations.

Look Alikes: Northwestern sedge (*Carex concinnoides*) is not tufted but sends stems rising from rhizomes; leafy bracts are shorter than the lowest spike; spikes oriented above the leaves with more than five flowers per spike.

Indicator Value: A prominent sedge in whitebark pine (PIAL/RIMO2/POPU3) and subalpine fir plant associations (ABLA/ARCO9, ABLA/VAME, ABLA/VASC). Type indicator for the (ABLA-PIAL/VASC/ CARO5) plant association and the green fescue/Ross sedge (FEVI-CARO5) plant community type.

Miscellany: Increases with disturbance. Low to moderately palatable. Tolerates ground fires and rebounds quickly.



Ross Sedge

Carex rossii

CARO5

Habit: Densely tufted perennial grass-like sedge; triangular culms, 4-8 inches tall; short rhizomes.

Leaves: Elongate, lax, 1/8 inch wide; basal sheaths reddish to burgundy.

Inflorescence: Terminal staminate spike with 1-4 shorter pistillate spikes below; few flowered; leafy bract subtends lowest spike and is longer than the inflorescence (Flowers: May - August).



Holm's Rocky Mountain Sedge

Carex scopulorum

Family - Cyperaceae

CASC12

Range: British Columbia to California in Cascades and Sierras; Alberta south in Rocky Mountains to Colorado.

Habitat: Wet meadows in subalpine and alpine environments; also along streams, lake shores, and moist slopes above treeline.

Look Alikes: Differentiate from other sedges: lowest bract shorter than inflorescence; inflorescence with the upper spike staminate and lower spike pistillate; purplish-brown perigynia.

Indicator Value: Defines the green fescue - Holm's Rocky Mountain sedge (FEVI-CASC12) community in the Wallowa Mountains.

Miscellany: A common riparian and meadow plant that tends to increase with site disturbance.



Holm's Rocky Mountain Sedge

Carex scopulorum

CASC12

Habit: Perennial, stoloniferous, sod forming, plants 2-3 feet tall; culms triangular in cross-section.

Leaves: Shorter than culms, firm, flat, 1/4 inch wide with revolute margins.

Inflorescence: Spikes about 1 inch long; upper spike-all male flowers; lower 2 or 3 spikes - all female flowers; bracts blackish at base; perigynia - pale greenish below to purplish-brown above; beak purplish-brown; stigmas - 2 (Flowers: July - August).



Drummond's Rush

Juncus drummondii

Family - Juncaceae

Range: Alaska to California and throughout the high elevations of the mountains of the western United States.

Habitat: Alpine and subalpine meadows, streambanks, lakeshores, moist ridges, and slopes.

Look Alikes: Other rushes. Parry's rush (*Juncus parryi*) has brownish flowers. Slender rush (*J. tenuis*) has greenish flowers.

Indicator Value: Prominent in cold air drainage and ponding communities. Increases with disturbance in campsites and in green fescue communities on gentle slopes or ridgetops. Type indicator of subalpine fir/Drummond's rush (ABLA/JUDR) plant community type.

Miscellany: Rushes resemble sedges and grasses - but are neither. Rushes have solid, unjointed stems. Grasses have hollow, jointed stems. Sedges have stems with "edges" and floral parts in 3's. Drummond's rush is little used by ungulates.



Drummond's Rush

Juncus drummondii

JUDR

Habit: Perennial, mat-forming, numerous stems up to 16 inches tall, fibrous roots.

Leaves: All basal; appearing leafless at the base (leaves reduced to sheaths - bladeless).

Inflorescence: 1-3 flowers subtended by 2 brownish bractlets at the top of each stem. Perianth green with brown margins; stamens - 6; anthers longer than the filaments. Fruit - capsule, dark brown (Flowers: July - September).



Parry's Rush

Juncus parryi

Family - Juncaceae

JUPA

Range: British Columbia to California in Cascades and Sierras, eastward to the Rocky Mountains from Alberta to Colorado.

Habitat: Alpine and subalpine meadows and slopes. Also along streams and lake margins.

Look Alikes: Other rushes; especially those with inflorescences below the tip of the flowering stems. Drummond's rush (*J. drummondii*) often occurs nearby but is leafless. Use the brownish flowers (instead of greenish) and the inflorescences occurring below the top of the flowering stems to differentiate Parry's rush from others.

Indicator Value: Moist areas on relatively dry and stony ridges; and slopes at subalpine and alpine elevations. Type indicator for the green fescue-Parry's rush (FEVI-JUPA) plant association. Also indicates the ABLA-PIAL/JUPA-STLE2 plant associations. Commonly occurs with grouse huckleberry beneath subalpine fir and whitebark pine.

Miscellany: Due to its wiry stems and short leaves the plant is usually avoided by grazing animals. Native Americans used rushes for baskets and mats. Also used rushes to teach children how to weave.



Parry's Rush

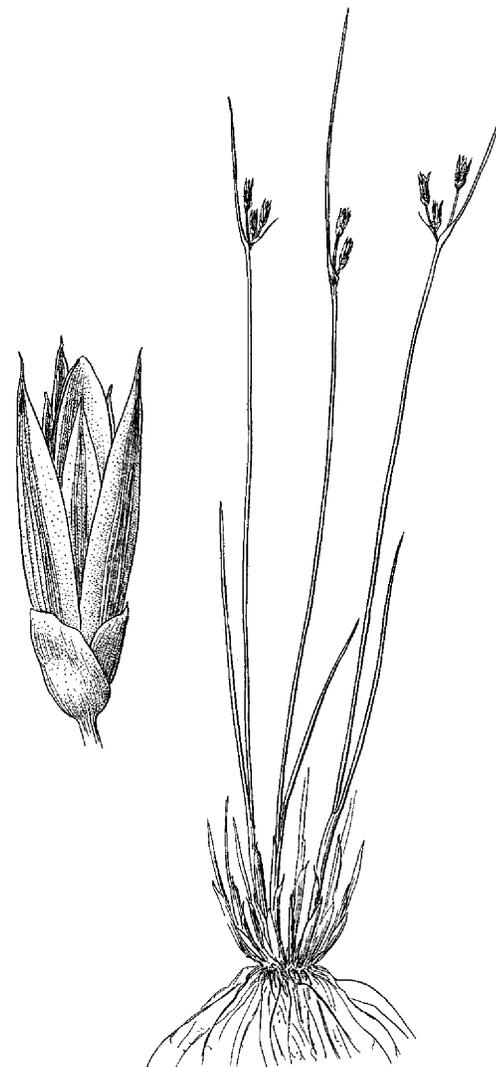
Juncus parryi

JUPA

Habit: Perennial, densely tufted with numerous stems 4-12 inches tall.

Leaves: Upper leaf blades 1/2-1.5 inches long; basal leaves absent or with bristle-like blades growing from basal sheaths.

Inflorescence: 1-3 single, brownish flowers grouped together below the top of the flowering stem and subtended by 2 brownish bracts. Six stamens with anthers much longer than the filaments (Flowers: July - September).



Smooth Woodrush

Luzula hitchcockii

Family - Juncaceae

Range: British Columbia and Alberta south to Oregon, Idaho (occurs prominently in the Seven Devils Mountains), and Wyoming.

Habitat: Found on metavolcanics in the Seven Devils with whitebark pine, subalpine fir, and Engelmann spruce. Favors coves, cirque basins, concave microtopography where cold air ponds and snows linger long into the summer season.

Look Alikes: Other woodrushes that have flat, wide, basal, and purplish-brown inflorescences. *Luzula parviflora* - has at least 4 stem leaves. *L. wahlenbergii* - has only 1-3 stem leaves but leaves are narrow (1/8 inch wide). *L. campestris* - spikelike inflorescence.

Indicator Value: Cold environments where snow lingers long into summer. Indicator for the whitebark pine/grouse huckleberry/smooth woodrush (PIAL/VASC/LUH14) plant association. Also forms communities with subalpine fir and Engelmann spruce (ABLA-PIEN/LUH14, ABLA-PIEN/MEFE).

Miscellany: Provides forage for elk and bear. Regenerates by rhizomes into extensive colonies (mats). Fire consumes above-ground biomass; resprouts from surviving rhizomes.



Smooth Woodrush

Luzula hitchcockii

LUH14

Habit: Perennial with short rhizomes; height 6-20 inches.

Leaves: Culms round, hollow. Leaves 2-3 per stem; shiny, 1-2 inches long; basal leaves flat, up to 1/2 inch wide; cauline leaves lanceolate, hairy at base. Tip of leaves reddish-brown.

Inflorescence: Open panicle. Flowers nodding to erect; perianth dark purplish-brown with scarious margins, capsule - ovate, purplish-brown, with 3 seeds.



Western Yarrow

Achillea millefolium (var. *lanulosa*)

ACMIL

Family - Asteraceae

Range: Wide ranging from Manitoba to British Columbia, south to Kansas, New Mexico, Arizona, California and northern Mexico.

Habitat: Wide range of sites - plains to subalpine in dry, open areas; from bunchgrass to forest.

Look Alikes: The fern-like leaves are very distinctive. Scarlet gilia (*Gilia aggregata*) leaves are also pinnatifid but have no fine leaflets (are more skeletal). At subalpine and alpine elevations (over 8,000') the variety *alpicola* is differentiated by dark brown to black involucral bract margins.

Indicator Value: Disturbance indicator. Resistant to heavy grazing. Forms dense stands on old bedding grounds or salt grounds. Present in virtually all rangeland plant associations. Also common in whitebark pine and subalpine fir forested subalpine communities.

Miscellany: The most common plant in the inland Pacific Northwest. Low in palatability. Used primarily by sheep, pronghorns and deer when it is succulent in early season. Sage grouse also use the plant. Flower heads are most sought after part of the plant. Nez Perce ground dried plants into

flour; used leaves to stop bleeding and heal rashes; made tea from leaves to stop fevers. A blood clotting extract from the plant (achillein) used by pharmacists today to reduce blood clotting time. A tea from stems, leaves and flowers helps regulate digestion and reduce lethargy. Good for dried wintertime floral arrangements.



Photo by Karl Urban

Western Yarrow

Achillea millefolium (var. *lanulosa*)

ACMIL

Habit: Perennial forb, aromatic, rhizomatous.

Stems: Erect, 4-40 inches tall; single stem with some sidebranches; glabrous to pubescent.

Leaves: Alternate, pinnately dissected (cauline leaves sessile; lower leaves petioled); up to 6 inches long; fern-like in appearance; lightly pubescent.

Flowers: Numerous heads, 3-5 white rays, in a flat-topped corymb (Flowers: April - October).

Fruit: Achene.



Nettleleaf Horsemint

Agastache urticifolia

Family - Lamiaceae

AGUR

Range: Southeastern British Columbia to western Montana, eastern Washington, eastern Oregon to Colorado and California.

Habitat: On open slopes from the foothills to high elevation ridges and forest openings. Often forms dense stands on overgrazed sites at higher elevations. Commonly found with mountain brome, bluebells on degraded green fescue sites.

Look Alikes: May be confused with other mints having square stems but the large size of this plant with its dense terminal spikelike inflorescence makes it distinctive. Stinging nettle (*Urtica dioica*) is tall with opposite, large leaves but its leaves and stems are pubescent (stinging hairs) with paniculate inflorescence in the leaf axils (not spike-like at top of plant).

Indicator Value: Increaser with overgrazing. Common in mountain big sagebrush, mountain snowberry, and in Hood's sedge-mountain brome (CAHO5-BRCA5) communities.

Miscellany: Provides fair forage for cattle; good forage for sheep, deer and elk. Seeds may be eaten (raw or cooked).



Photo by Karl Urban

Nettleleaf Horsemint

Agastache urticifolia

AGUR

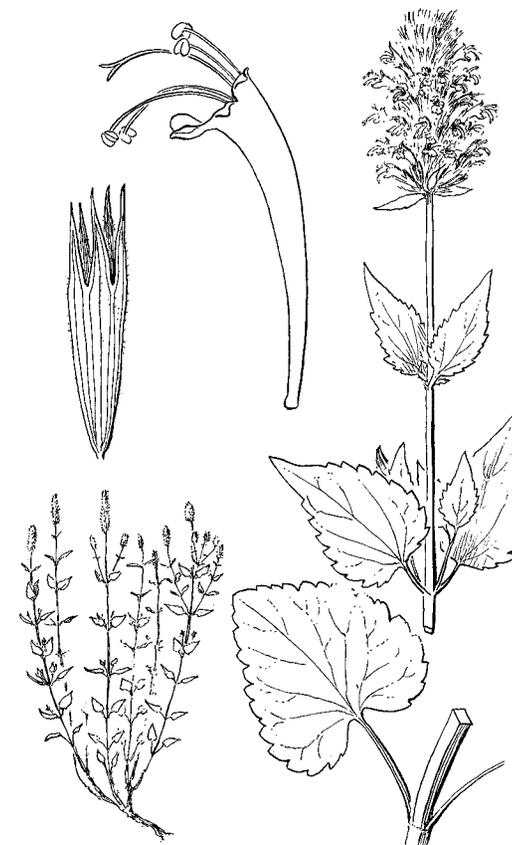
Habit: Perennial herb 1.5-5 feet tall, fibrous rooted, strongly aromatic.

Stems: Erect; numerous from a woody caudex; square in cross section.

Leaves: Simple; opposite; blades coarsely scalloped; ovate to deltoid, 2-4 inches long; petiole up to 2 inches long; glabrous.

Flowers: Dense spikelike inflorescence, 1.5-6 inches long; calyx tinged lavender - purple; corolla irregular, tubular; white to rose or purplish; upper lip notched; lower lip 3-lobed; stamens exerted (Flowers: June - August).

Fruit: Nutlets.



Pale Agoseris

Agoseris glauca

Family - Asteraceae

Range: British Columbia to California; Arizona; east to Manitoba in Canada and Minnesota in the United States.

Habitat: Dry meadows; common on disturbed or eroded sites.

Look Alikes: Dandelion (*Taraxacum officinale*) - leaves pinnatifid with lobes pointing downward; beaks of achene 2-3 times longer than the achene.

Indicator Value: Indicator of the Parry's rush - pale agoseris (JUPA-AGGL) community. Also occurs in green fescue communities - especially with Parry's rush (FEVI-JUPA); Idaho fescue communities - especially Idaho fescue - junegrass (FEID-KOCR) and Idaho fescue - Hood's sedge (FEID-CAHO5); and in Sedge - needlegrass (CAREX-STOC2) communities. Abundance at greater than 5-10% cover indicates increases due to disturbance (ungulate, erosion).

Miscellany: Seeds disseminated by wind employing the silky pappus ("like a parachute"). The scape or leaves exude a milky juice when cut. The milky juice thickens on exposure to air. Used by Native Americans as

"chewing gum" to clean their teeth. The specific name "glauca" refers to the glaucous or waxy surface of the leaves. Tends to decrease with domestic sheep grazing. Increases with cattle grazing. Abundance indicates poor rangeland condition.



AGGL

Pale Agoseris

Agoseris glauca

AGGL

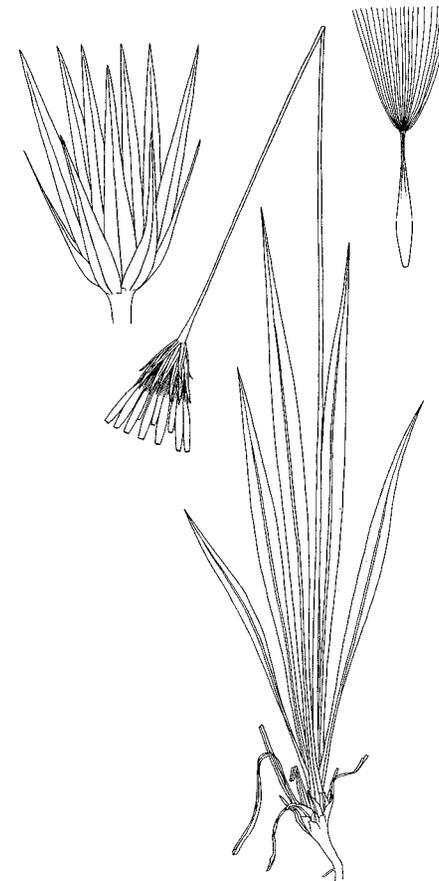
Habit: Perennial, 4-15 inches tall, long taproot from a single or branched caudex.

Stem: Long, erect scape; glabrous; leafless.

Leaves: Leaves lanceolate to oblanceolate, up to 12 inches long and 1.25 inch wide); entire, sometimes with a few oblong lobes or teeth; sometimes purple-spotted; all basal; glaucous with a distinct white midvein.

Flowers: Heads - yellow (drying pinkish); single; terminal. Ray flowers strap-like and toothed on ends (Flowers: June - September).

Fruit: Achene with a beak about half as long as the achene; pappus silky.



Piper's Anemone

Anemone piperi

Family - Ranunculaceae

Range: Eastern Washington, northeast Oregon, north and central Idaho to western Montana.

Habitat: Shady, forested sites in Douglas-fir and true fir plant associations.

Look Alikes: Sweet cicely (*Osmorhiza chilensis*) leaflets are very similar. Differentiate using the licorice taste. Fruits and flowers are distinctively different. Goldthread (*Coptis occidentalis*) leaflets are shiny and more ovate than anemone leaves.

Indicator Value: Highly associated with big huckleberry in true fir plant associations. Common in ABLA/VAME, ABLA/ARCO9, and ABGR/VAME plant associations.

Miscellany: Used as an ointment by Native Americans to treat ulcerations; internally for lockjaw.



Piper's Anemone

Anemone piperi

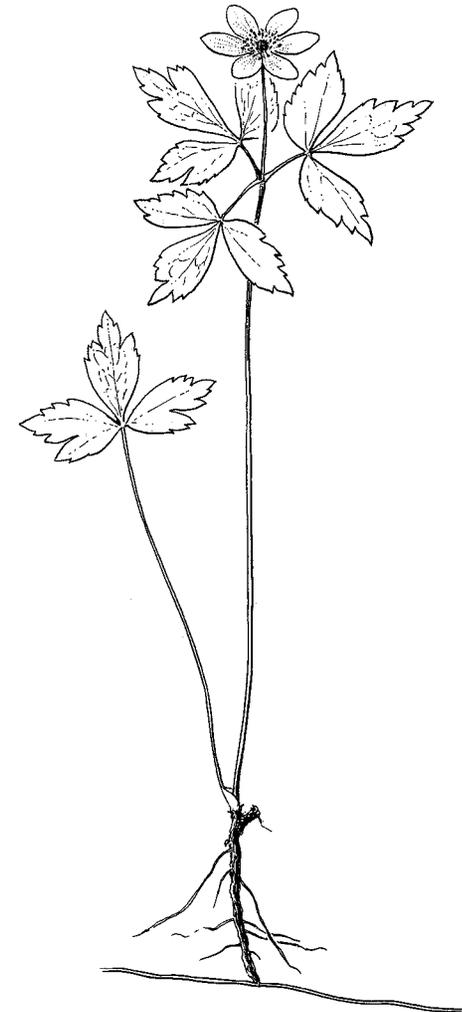
ANPI

Habit: Erect, deciduous, rhizomatous perennial, up to 14 inches tall.

Leaves: Basal leaves may be lacking if present, a single leaf with three doubly serrate leaflets; cauline leaves in whorl of three short-petioled leaves of three leaflets each. Coarsely serrate and incised.

Flowers: Apetalous; sepals solitary, white or pinkish, flowers 3/4-1 inch wide (Flowers: late April - early August).

Fruit: Hairy, elliptic achene.



Alpine Pussytoes

Antennaria alpina

Family - Asteraceae

ANAL4

Range: Western mountains at alpine and subalpine elevations as far south as California and east to Colorado.

Habitat: Moist meadows; fellfields; rocky, dry slopes and ridges; on moist snowbank sites.

Look Alikes: Other pussytoes: *A. lanata* - plant under 8 inches tall; involucre bracts woolly; black-green with white tips. *A. luzuloides* - plant up to 12 inches tall; involucre bracts pale greenish-brown; not woolly. *A. microphylla* - plant up to 12 inches tall; involucre bracts with pink to deep pink tips. Pearly everlasting (*Anaphalis margaritacea*) - lacks basal leaves; stem leaves of equal length.

Indicator Value: Common in green fescue communities (FEVI-JUPA; FEVI-CASC12, FEVI-PENST), in subalpine fir - whitebark pine communities, and as an alpine member of fellfields and turf communities.

Miscellany: Named "pussytoes" for the disc flowers of the heads (resemble cat's paws).



Alpine Pussytoes

Antennaria alpina

ANAL4

Habit: Perennial, low, less than 6 inches tall, stoloniferous, mat forming.

Stem: Gray hairy, 6 inches tall or less.

Leaves: Densely gray woolly.

Basal - oblanceolate; about 1 inch long; 1/4 inch wide.

Cauline - few, linear; dark brown tips; alternate and reduced in size upwards.

Flowers: Heads of disc flowers (few in a dense cyme); woolly involucre bracts, sharp pointed, dark greenish-blade with white to tan tips (Flowers: June - September).

Fruit: Achene.



Woolly Pussytoes

Antennaria lanata

Family - Asteraceae

ANLA3

Range: British Columbia and Alberta to northeast Oregon, Idaho, and Wyoming.

Habitat: Moist meadows; exposed rocky sites in the subalpine and alpine.

Look Alikes: Other pussytoes: *A. microphylla* - plant up to 12 inches tall; involucre bracts with pink to deep pink tips. *A. luzuloides* - plant up to 12 inches tall; involucre bracts pale greenish-brown; not woolly. *A. alpina* - brownish green to black involucre bracts; sharp pointed. Pearly everlasting (*Anaphalis margaritacea*) - lacks basal leaves; stem leaves of equal length.

Indicator Value: Common in the green fescue - Parry's rush (FEVI-JUPA) plant association; subalpine fir-whitebark pine/grouse huckleberry - pink mountain heath (ABLA/VASC-PHEM) and subalpine fir-Engelmann spruce/Labrador tea (ABLA-PIEN/LEGL) plant associations.

Miscellany: The "woolly" plant is able to persist in cold, windy, moisture-desiccating environments due to the dense hairs that help insulate and retain heat and water.



Woolly Pussytoes

Antennaria lanata

ANLA3

Habit: Perennial with a branched caudex.

Stem: Densely hairy, 4-8 inches tall.

Leaves: Densely gray-woolly.

Basal - oblanceolate, tufted, erect; up to 4 inches long and 3/8 inch wide; 3 prominent veins.

Cauline - narrower and reduced upwards.

Flowers: Heads in a compact cyme. Involucre bracts densely woolly, dark brown to blackish-green; tips pale to whitish (Flowers: June - September).

Fruit: Achene.



Rosy Pussytoes

Antennaria microphylla (*A. rosea*)

ANMI3

Family - Asteraceae

Range: Alaska to Ontario, Canada; south to California, New Mexico, Colorado, and Nebraska.

Habitat: Openings in forest, dry meadows, subalpine meadows and ridges, fellfields and turf communities above treeline.

Look Alikes: Other pussytoes: *A. alpina* - brownish green to black, sharp pointed involucre bracts. *A. umbrinella* - brown, blunt involucre bracts. *A. lanata* - plant under 8 inches tall; involucre bracts woolly, black-green with white tips. *A. luzuloides* - plant up to 12 inches tall; involucre bracts pale greenish-brown - not woolly. Pearly everlasting (*Anaphalis margaritacea*) - lacks basal leaves; stem leaves of equal length.

Indicator Value: Commonly found in mountain big sagebrush plant associations (ARTRV/CAGE2; ARTRV/FEID-AGSP); Idaho fescue plant associations (FEID-DAIN-CAPE7; FEID-AGSP-CYTEF, FEID-CAHO5); and Hood's sedge communities.

Miscellany: The most common *Antennaria*. Named "pussy toes" for the flower heads appearing like cat paws. Another common name "everlasting" refers to the dried plant retaining its coloration; valued for dry floral arrangements. Eaten by Columbia ground squirrels. Reproduces either from seed or vigorously by stolons.



Rosy Pussytoes

Antennaria microphylla (*A. rosea*)

ANMI3

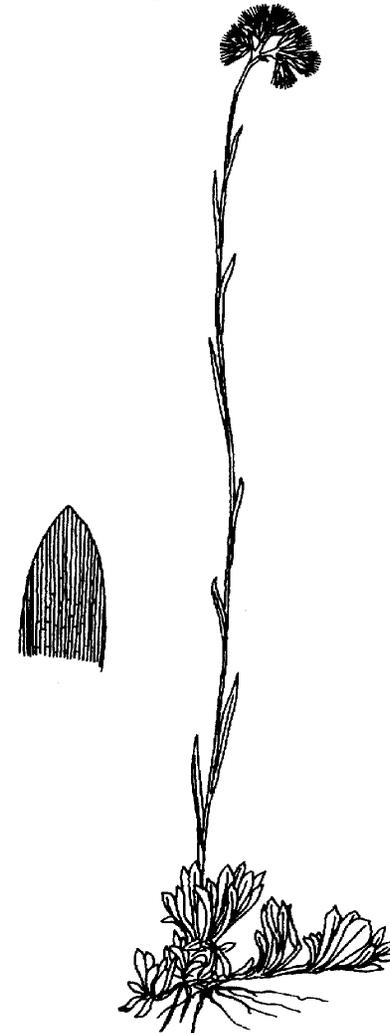
Habit: Perennial, stoloniferous, mat-forming; grayish tint from tomentose - floccose hairs covering the plant; stolons 1/2-2 inches long.

Stem: Hairy-gray, 2.5-12 inches tall.

Leaves: Oblanceolate or spatulate, 1/2-1.25 inches long, hairy on both sides; simple, alternate; mostly basal. Cauline leaves strongly reduced upwards.

Flowers: Heads (2-13) consisting entirely of disk flowers in a congested to open cyme. Involucre bracts greenish or brownish at base with pink to deep pink tips (Flowers: June - August).

Fruit: Achene.



Prickly Sandwort

Arenaria aculeata

Family - Caryophyllaceae

ARAC2

Range: Southwestern Montana, central Idaho, northeastern Oregon to Utah, Nevada and northeastern Nevada.

Habitat: Open, rocky slopes, ridges, crevices in rock outcrops from 5,500 feet to alpine.

Look Alikes: The linear, sharp, needle-like leaves form mats which are distinctive. Differentiate from other sandworts as follows: ballhead sandwort (*Arenaria congesta*) - inflorescence headlike (congested); bigleaf sandwort (*A. macrophylla*) - leaves broad (up to 15 mm).

Indicator Value: Broad ecologic range - from sagebrush desert to alpine slopes. Especially common on granitic-derived soils in the whitebark pine and drier subalpine fir plant associations. Type indicator for PIAL/ARAC2, PIAL/VASC/ARAC2, ABLA-PIAL/ARAC2, ABLA-PIAL/VASC/ARAC2 plant community types and communities.



Prickly Sandwort

Arenaria aculeata

ARAC2

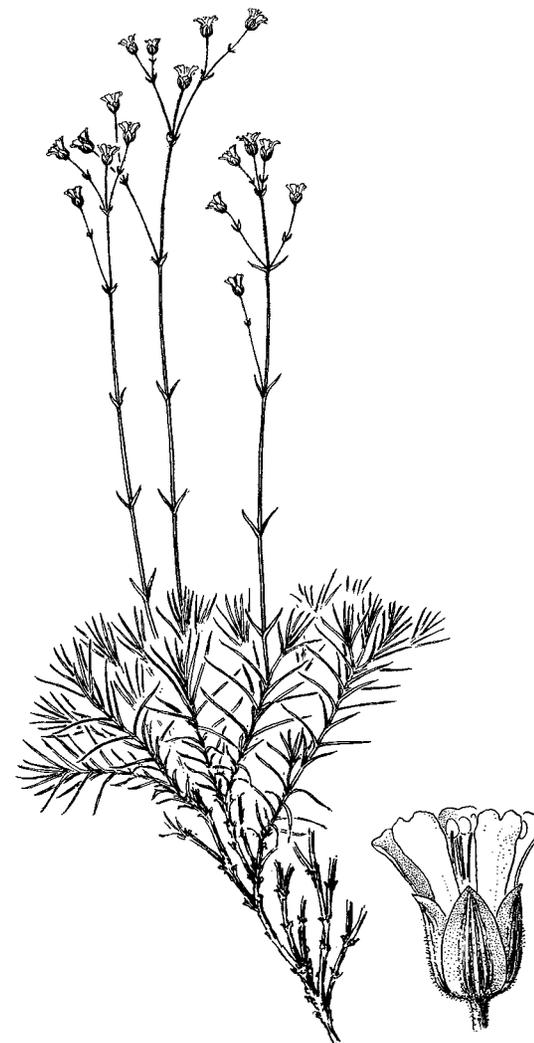
Habit: Perennial, mat-forming from branched caudex, 2-6 inches tall.

Stems: Flowering stems numerous, 4-8 inches tall; glandular pubescent above.

Leaves: Mostly basal, 1/2-1 inch long; linear, rigid (needle-like); glaucous; sharp pointed ("pin cushion"); only 1-2 pairs of stem leaves, less than 5 mm long.

Flowers: Open, diffuse cymes; sepals obtuse and purplish-tinged; glandular; petals twice as long as sepals; white (Flowers: June - August).

Fruit: Capsule.



Ballhead Sandwort

Arenaria congesta

Family - Caryophyllaceae

Range: East of Cascades in Washington to Sierra Nevada in California; east to Rocky Mountains of Montana, Idaho, Wyoming, and Colorado.

Habitat: Rocky sites in open forest to alpine landscapes (ridges, talus, fellfields).

Look Alikes: Differentiated from prickly sandwort (*A. aculeata*) by longer leaves and congested head-like cluster of flowers.

Indicator Value: Prominent in Idaho fescue - prairie junegrass (FEID-KOCR) and Idaho fescue - timber oatgrass - Liddon's sedge (FEID-DAIN-CAPE7) plant associations. Also found in phlox-cymopterus (PHLOX-CYTEF) and mountain big sagebrush communities.



Ballhead Sandwort

Arenaria congesta

ARCO5

Habit: Perennial forb, caespitose, arising from a branched caudex, mat-forming, 2-5 inches broad.

Stem: Flowering stem up to 12 inches tall; 2-4 pairs of leaves ascend and reduce in length toward the inflorescence.

Leaves: Linear, narrow, sharp-pointed; up to 3 inches long; ascending; glabrous.

Flowers: Head-like cluster of many white, clawed flowers; petals twice as long as sepals; stamens - 10; styles - 3 (Flowers: June - August).

Fruit: Capsule (3-valved).



Bigleaf Sandwort

Arenaria macrophylla

Family - Caryophyllaceae

Range: Widespread in the Pacific Northwest.

Habitat: Open to closed canopy forests; warm, dry to warm, moist environments.

Look Alikes: Sticky chickweed (*Stellaria jamesiana*) leaves are also opposite, but lanceolate and several times longer than broad (1-4 inches long).

Indicator Value: Occurs predominantly in grand fir and subalpine fir plant associations. Most abundant on areas where shading animals have created disturbance. Common in ABLA/VASC, ABLA/VAME, ABLA/CAGE, ABLA/ARCO9, ABGR/VAME, and ABGR/CAGE plant associations.

Miscellany: Ubiquitous, small plant appearing as an annual throughout many of our forested understories. Unpalatable.



Photo by Karl Urban

Bigleaf Sandwort

Arenaria macrophylla

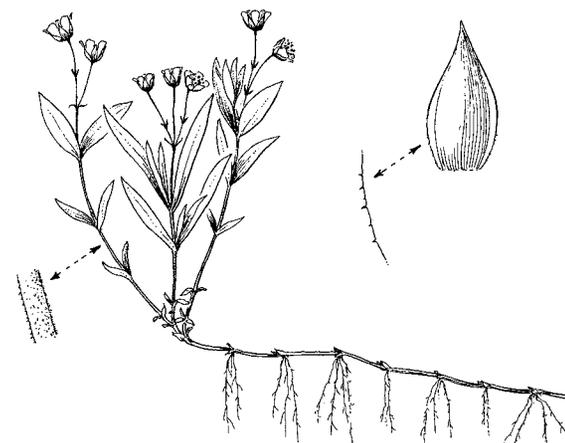
ARMA18

Habit: Deciduous, perennial, 2-6 inches tall, extensive slender rhizomes, mat-forming.

Leaves: Opposite, linear-elliptic to lanceolate, 1-2 inches long, entire margin, dark green.

Flower: White, petals shorter than sepals, 2-5 flowers on long petioles, borne in terminal cymes (Flowers: May - August).

Fruit: Globose capsule.



Heartleaf Arnica

Arnica cordifolia

Family - Asteraceae

Range: Pacific Northwest (rare west of Cascades).

Habitat: Warm, moist forests at mid elevations.

Look Alikes: Mountain arnica (*Arnica latifolia*) has several floral heads per stem; sessile cauline leaves; nonembedded veins in leaves.

Indicator Value: Wooded, open forest understories often have high compositions of heartleaf arnica. Increases with disturbances (fire, grazing). Type indicator for ABLA/ARCO9, ABLA-PIAL/VASC/ARCO9, ABLA-PIEN/ARCO9 plant associations. Common in subalpine fir forests.

Miscellany: Mountain arnica (*A. latifolia*) may hybridize with heartleaf arnica. Native Americans used flowers in a steeped solution as a salve to wounds or cuts. Palatability is low - flowers used by sheep and horses.



Heartleaf Arnica

Arnica cordifolia

ARCO9

Habit: Deciduous, perennial forb, 4-24 inches tall, rhizomatous.

Leaves: Opposite, heart-shaped, toothed, 2-5 inches long, fuzzy hairy, veins embedded; cauline leaves reduced and petiolate, becoming sessile at top of stem.

Flowers: Yellow rays; heads - 1 per stem; involucre bracts densely hairy (Flowers: April - June).

Fruits: Achene - short hairy to glandular.



Longleaf Arnica

Arnica longifolia

Family - Asteraceae

ARLO6

Range: Southern Alberta to Washington, and south to Colorado, Nevada, Utah & California.

Habitat: Well drained soils near seeps, springs; wet talus, scree and rocky streambanks in the subalpine and alpine environments.

Look Alikes: Other yellow composites. Arnicas have paired cauline leaves. This arnica is the only one forming dense patches.

Indicator Value: Type indicator of linanthastrum - longleaf arnica (LINU4-ARLO6) communities.



Longleaf Arnica

Arnica longifolia

ARLO6

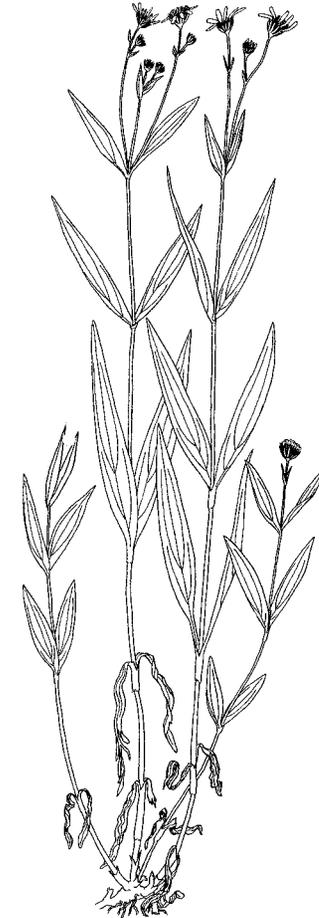
Habit: Perennial forb forming large, dense patches. Rhizomatous with branched caudex.

Stem: Erect, clustered, 12-24 inches tall; many sterile leafy stems.

Leaves: All are cauline, 5-7 pairs opposite on flowering stem; up to 7 inches long, 1/2-3/4 inch wide. Entire, narrow, lanceolate; upper leaves clasping. Basal leaves lacking.

Flowers: Heads 3 to many; involucre glandular-puberulent with acute to acuminate bracts; ray flowers 8-13; 1/2-3/4 inch long, yellow (Flowers: July - September).

Fruit: Achene with brownish pappus.



Western Mugwort

Artemisia ludoviciana

Family - Asteraceae

ARLU

Range: British Columbia to California and Mexico; east to Ontario, Canada and to Arkansas.

Habitat: Scree, talus, rocky ridges in the alpine. Moist to dry open meadows and slopes in grasslands, shrublands, and forest communities.

Look Alikes: Other herbaceous sagebrush found in subalpine and alpine environments. Differentiate as follows:

A. dracunculus (leaves dark green; not lobed).

A. michauxiana (leaves dissected into many narrow lobes).

A. tilesii (leaves green and shiny on upper surface).

Indicator Value: Rapid colonizer of disturbed sites; invader of overgrazed sheep rangelands. Common in linanthustrum - western mugwort (LINU4-ARLU), Hood's sedge - mountain brome (CAHO5-BRCA5), and Idaho fescue - Wallowa penstemon (FEID-PESP2) communities.

Miscellany: Easily top-killed by fire; readily sprouts from plant base or rhizomes following burns. Seasonally (early spring and late fall) important

for mule deer, elk, and domestic sheep. Native Americans used crushed leaves for treating headaches and coughs; salve from leaves for hemorrhoids, and tea for stomach disorders. Also popular for pillow stuffing by early settlers due to the aromatic leaves. Mosquitoes repelled by burning in campfires.



Western Mugwort

Artemisia ludoviciana

ARLU

Habit: An aromatic perennial forb with creeping rhizomes.

Stem: Simple, 12-36 inches tall, white-tomentose.

Leaves: Alternate, cauline, lanceolate to deeply lobed, entire; 1-4 inches long, up to 1/2 inch wide; blades white tomentose below, green and glabrous on top.

Flowers: Yellowish heads in narrow, dense, leafy panicles; marginal ray flowers - pistillate; center disc flowers - perfect; involucre - tomentose (Flowers: August - September).

Fruit: Achene, no pappus.



Alpine Aster

Aster alpigenus
Family - Asteraceae

ASAL2

Range: Washington to southern California; east to western Montana, western Wyoming, and to northeastern Nevada.

Habitat: Open meadows, grassy slopes and fellfields in alpine and subalpine environments.

Look Alikes: Involucral bracts of asters are “shingled” in multiple series; involucral bracts of daisies (*Erigeron* spp.) are in a single series. Other high elevation asters:

A. integrifolius - flowers several; leaves wider (over 1 inch); glandular inflorescence.

A. foliaceus - flowers several; leaves wider (1 inch) and clasping the stem; leafy outer involucral bracts.

Indicator Value: Occurs in green fescue communities. Common in the green fescue - Parry's rush (FEVI-JUPA) plant association and in subalpine fir - whitebark pine forest communities.



Alpine Aster

Aster alpigenus

ASAL2

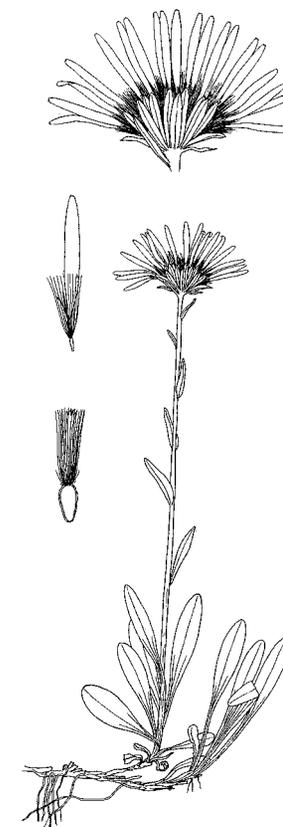
Habit: Perennial, dwarf in alpine habitats, often taprooted from a branched caudex.

Stem: One to several stems, up to 12 inches tall. Only attains 2-3 inches in height in alpine fellfield communities.

Leaves: Basal leaves linear (grass-like); persist through summer. Entire margins, up to 10 inches long (only 4 inches long on alpine sites). Cauline leaves few and reduced upwards.

Flowers: Heads solitary. Involucral bracts purplish in 2-3 series; ray flowers (10-40) deep purple to lavender; disk flowers - yellow (Flowers: July - August).

Fruit: Achenes - glabrous; pappus barbellate.



Leafy Aster

Aster foliaceus

Family - Asteraceae

Range: Alaska to Washington to northwestern Montana and adjacent Alberta.

Habitat: Moist sites (meadows, streambanks, aspen groves) and mesic grasslands in subalpine environments.

Look Alikes: Daisies (*Erigeron* spp.) - involucre bracts in single series. (Asters) - involucre bracts in multiple series - "shingled." Other high elevation asters:

A. alpigenus - flowers solitary, leaves narrow - "grasslike."

A. integrifolius - flowers several, leaves wider - over 1 inch; glandular inflorescence.

Indicator Value: Occur in green fescue - penstemon (FEVI-PENST), alpine fleecflower (POPH), and quaking aspen/elk sedge (POTR5/CAGE2) communities. Also found in subalpine fir - whitebark pine forest and mountain big sagebrush communities.

Miscellany: The specific name "foliaceus" refers to the large leaf-like involucre bracts. The variety *cusickii* occurs in the subalpine of the Wallowa Mountains.



ASFO

Leafy Aster

Aster foliaceus

ASFO

Habit: Perennial from a creeping rhizome.

Stem: Clustered, reddish, 12-36 inches tall, 4-10 inches tall in alpine environments.

Leaves: Upper leaves - alternate, sessile and clasping; lanceolate, 2-5 inches long; margins entire. Lower leaves - petiolate, oblanceolate to obovate; entire, glabrous, often deciduous, 5-8 inches long.

Flowers: Heads mostly solitary, corymbose; involucre bracts purple-tipped, inner bracts shorter; ray flowers - purple, bluish purple, rose, or lavender, 10-50 in number, 1/2-3/4 inch long; disk flowers - yellow (Flowers: July - September).

Fruit: Achene - pubescent, pappus-white with brownish to reddish hair-like bristles.



Thick-stemmed Aster

Aster integrifolius

Family - Asteraceae

Range: Western Montana to southeast Washington; south to California and Colorado.

Habitat: Rocky meadows, open forest, to subalpine slopes.

Look Alikes: Other asters at high elevations: *A. alpigenus* - flowers solitary; leaves narrow - "grasslike." *A. foliaceus* - inflorescence not glandular.

Indicator Value: Wide ranging in the subalpine. Occurs with Hood's sedge (CAHO5-BRCA5, CAHO5 meadows); elk sedge (CAGE2-FEID); green fescue (FEVI-LULA3, FEVI-PENST, FEVI-LICA2, FEVI-CAHO5); Idaho fescue (FEID-CAHO5); and in mountain big sagebrush, subalpine fir, and alpine fleecflower communities.



ASIN3

Thick-stemmed Aster

Aster integrifolius

ASIN3

Habit: Perennial, erect, fibrous rooted from a short caudex or rhizome, often forms large patches.

Stem: Solitary to clustered, 8-28 inches tall; glandular near the inflorescence.

Leaves: Lower - oblanceolate to elliptic, 3-10 inches long, petioled, entire. Upper: sessile, reduced upward, clasping, oblong to lance-shaped, entire.

Flowers: Few to several heads, corymbose; peduncles and involucre glandular; involucre bracts in 3 series (green to purplish tinged) with outer bracts wider than the inner ones; ray flowers: purple, violet, 10-27 rays about 1/2 inch long; disk flowers - yellow (Flowers: July - August).



Wavy-leaved Paintbrush

Castilleja applegatei

CAAP4

Family - Scrophulariaceae

Range: Eastern Oregon to central and southern Idaho to western Wyoming and northern Utah; south to Nevada and central California.

Habitat: High mountainous slopes on sandy, gravelly soils and talus.

Look Alikes: *C. rubida* - violet purple to purple-red; corolla lower lip almost as long as the galea (upper lip). *C. fraterna* - bright red; corolla lower lip less than half the length of the galea (upper lip). *C. applegatei* - bright red; galea 5 times or more the length of lower lip; leaf margins entire (wavy). *C. miniata* - scarlet; leaves linear and entire; corolla 3/4-1.5 inches long. *C. rhexifolia* - crimson to rose-purple; leaves linear and entire; corolla less than 3/4 inch long.

Indicator Value: Common in the mountain big sagebrush/elk sedge (ARTRV/CAGE2), mountain mahogany/Idaho fescue-bluebunch wheatgrass (CELE/FEID-AGSP), and Idaho fescue - bluebunch wheatgrass-cymopterus (FEID-AGSP-CYTEF) plant associations.

Miscellany: The bright red inflorescence of this paintbrush provides dazzling floral displays in the natural "rock gardens" of the subalpine slopes and ridges. They "beg to be photographed!"



Wavy-leaved Paintbrush

Castilleja applegatei

CAAP4

Habit: Erect perennial with a woody caudex.

Stem: Clustered, glandular, hairy, 5-24 inches tall.

Leaves: Alternate, glandular; lower leaves linear, lanceolate, entire with "wavy" margins. Upper leaves - three-lobed with middle lobe widest.

Flowers: Bright red; bracts deeply 3-5 parted equalling or longer than the flowers. Glandular - hairy; calyx equally cleft with lobes divided into 2 acute "teeth." Corolla exceeds the calyx, 3/4-1.5 inches long. Galea, about 1/2 inch long (5 or more times longer than the dark green lower lip) (Flowers: June - August).

Fruit: Capsule.



Fraternal Paintbrush

Castilleja fraterna

Family - Scrophulariaceae

CAFR8

Range: Restricted to the Wallowa Mountains.

Habitat: Subalpine to alpine peaks, ridges, cliffs on sandy soils. Often on Martin Bridge limestone - but not restricted to it.

Look Alikes: *C. rubida* - violet purple to purple-red; corolla lower lip almost as long as the galea (upper lip). *C. fraterna* - bright red; corolla lower lip less than half the length of the galea (upper lip). *C. applegatei* - bright red; galea 5 times or more the length of lower lip; leaf margins entire (wavy). *C. miniata* - scarlet; leaves linear and entire: corolla 3/4-1.5 inches long. *C. rhexifolia* - crimson to rose-purple; leaves linear and entire; corolla less than 3/4 inch long.

Indicator Value: A component in alpine fellfield and scree communities.

Miscellany: This is one of two paintbrushes restricted to specialized habitats with a range limited to the subalpine and alpine of the Wallowa Mountains. *C. rubida* is the other.



Fraternal Paintbrush

Castilleja fraterna

CAFR8

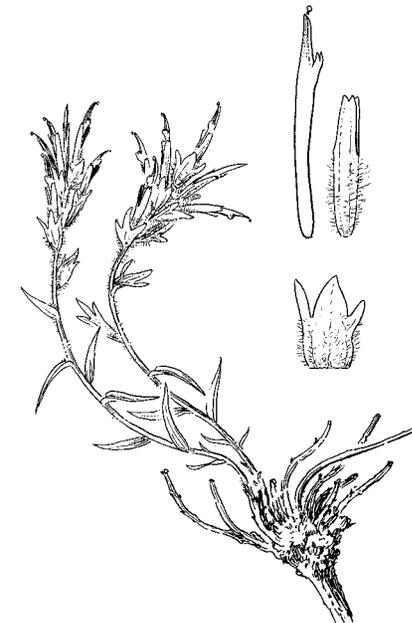
Habit: Perennial, branched caudex.

Stem: Clustered, ascending, unbranched, 4-6 inches tall, hairy and glandular.

Leaves: Lower: linear to lanceolate, entire, hairy. Upper: broader often with a pair of lobes, hairy.

Flowers: Bright red inflorescence. Bracts - shorter and broader than the leaves; ovate; acute tipped with short lateral lobes. Calyx - deeply subequally cleft; lobes cleft with 2 rounded to acute "teeth," 1/2-3/4 inch long. Corolla - tube twice the length of the short galea, 3/4-1 inch long. Galea - short, half the length of the tube (Flowers: August).

Fruit: Capsule.



Scarlet Paintbrush

Castilleja miniata

CAMI12

Family - Scrophulariaceae

Range: Occurs in every state and province of western North America from Alaska to California to New Mexico.

Habitat: Meadows, streambanks, and open coniferous forests in lower elevation subalpine environments.

Look Alikes: *C. rubida* - violet purple to purple-red; corolla lower lip almost as long as the galea (upper lip). *C. fraterna* - bright red; corolla lower lip less than half the length of the galea (upper lip). *C. applegatei* - bright red; galea 5 times or more the length of lower lip; leaf margins entire (wavy). *C. miniata* - scarlet; leaves linear and entire; corolla 3/4-1.5 inches long. *C. rhexifolia* - crimson to rose-purple; leaves linear and entire; corolla less than 3/4 inch long.

Indicator Value: Wide ranging in the lower subalpine. Occurs in subalpine fir forests (with huckleberries), mountain big sagebrush communities (with mountain snowberry, elk sedge, Hood's sedge), quaking aspen/elk sedge communities, and in the Idaho fescue - bluebunch wheatgrass-cymopterus (FEID-AGSP-CYTEF) plant association.

Miscellany: Our most common paintbrush in the lower subalpine. Also considered the most common species of *Castilleja* in the western mountains. Western hummingbirds are drawn by the scarlet bracts to the nectar producing flowers.



Scarlet Paintbrush

Castilleja miniata

CAMI12

Habit: Erect perennial with a woody caudex.

Stem: Clustered, glabrous to glandular, hairy, 8-30 inches tall.

Leaves: Alternate, glabrous, linear to lanceolate, 3-nerved; entire, upper most leaves may be 3-lobed.

Flowers: Bright red, scarlet or reddish-orange; bracts - broader than the leaves and shorter than the flowers; lower bracts are entire - upper bracts may be cleft into acute "teeth." Floral bracts are soft, long, and hairy. Calyx - 1/2-1.25 inches long; subequally cleft with lobes cleft into two linear, acute segments. Corolla - 3/4-1.5 inches long. Galea equals the corolla tube and is five times longer than the lower lip (Flowers: July - August).

Fruit: Capsule.



Alpine Paintbrush

Castilleja rhexifolia

CARH4

Family - Scrophulariaceae

Range: Rocky Mountains. Alberta and British Columbia south to Colorado and northern Utah; west through north and central Idaho to the Wallowa and Blue Mountains.

Habitat: Meadows, moist rocky slopes, talus in subalpine and alpine environments.

Look Alikes: *C. rubida* - violet purple to purple-red; corolla lower lip almost as long as the galea (upper lip). *C. fraterna* - bright red; corolla lower lip less than half the length of the galea (upper lip). *C. applegatei* - bright red; galea 5 times or more the length of lower lip; leaf margins entire (wavy). *C. miniata* - scarlet; leaves linear and entire: corolla 3/4-1.5 inches long. *C. rhexifolia* - crimson to rose-purple; leaves linear and entire; corolla less than 3/4 inch long.

Indicator Value: Common in talus and mountain big sagebrush/linanthastrum communities.

Miscellany: The most common high elevation *Castilleja* in the alpine/subalpine of the Rockies.



Alpine Paintbrush

Castilleja rhexifolia

CARH4

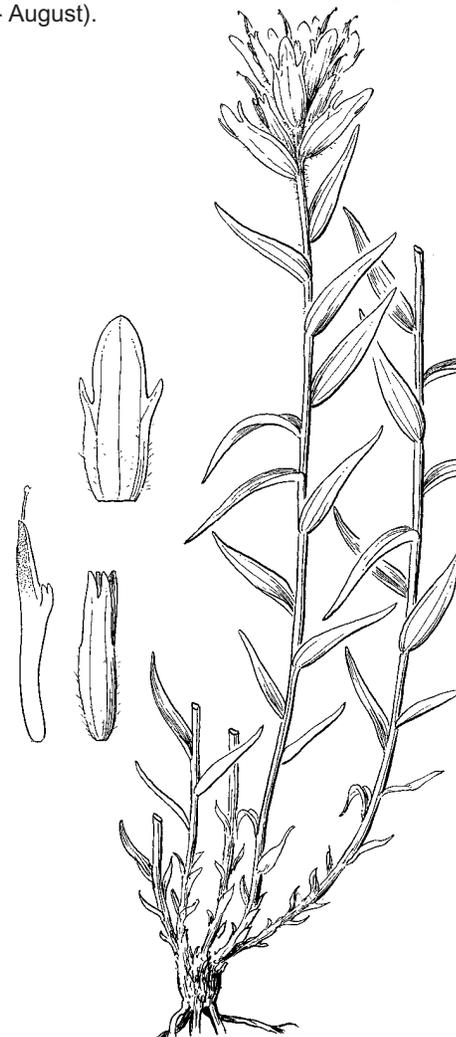
Habit: Erect perennial from a woody caudex.

Stem: Clustered, unbranched, 4-12 inches tall, glabrous to hairy.

Leaves: Alternate, linear to lanceolate, mostly entire, the uppermost may be 3-lobed; glabrous to hairy.

Flowers: Crimson, scarlet, purple to rose colored inflorescence. Bracts - rounded, entire or with 3 lobes, terminal lobe much broader than the lateral lobes. Calyx - subequally cleft, lobes divided into 2 segments, violet purple to purple red. Corolla - about 1/2 inch long, longer than the calyx. Galea - about 1/3 as long as the tube, purple, and 4-5 times longer than the lower lip (Flowers: June - August).

Fruit: Capsule.



Purple Alpine Paintbrush

Castilleja rubida

CARU8

Family - Scrophulariaceae

Range: Wallowa Mountains endemic (found nowhere else naturally).

Habitat: Often associated with, but not restricted to, limestone (Martin Bridge Formation) above treeline. Found in alpine open slopes in fellfields and turf communities.

Look Alikes: *C. rubida* - violet purple to purple-red; corolla lower lip almost as long as the galea (upper lip). *C. fraterna* - bright red; corolla lower lip less than half the length of the galea (upper lip). *C. applegatei* - bright red; galea 5 times or more the length of lower lip; leaf margins entire (wavy). *C. miniata* - scarlet; leaves linear and entire; corolla 3/4-1.5 inches long. *C. rhexifolia* - crimson to rose-purple; leaves linear and entire; corolla less than 3/4 inch long.

Indicator Value: A component of fellfield and turf communities; usually on limestone.

Miscellany: This is one of two paintbrushes restricted to specialized habitats with range limited to the alpine of the Wallowa Mountains.



Purple Alpine Paintbrush

Castilleja rubida

CARU8

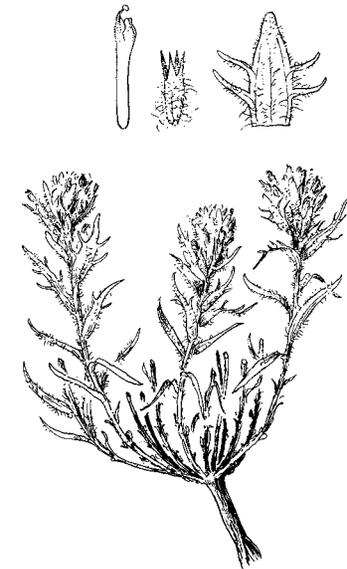
Habit: Perennial from a woody base.

Stem: Clustered, reclining, unbranched, reddish-purple, only 2-6 inches tall, hairy and slightly glandular.

Leaves: Lower - linear, entire. Upper - lobed with one or two pairs of linear "teeth."

Flowers: Dense, short, congested. Calyx - violet purple to purple red, 3/8 inch long; cleft into 4 equal lobes. Corolla - glandular hairy, exerted beyond the calyx, about 1/2 inch long. Galea - glandular hairy, 1/3 as long as the tube (Flowers: July - August).

Fruit: Capsule.



Queen's Cup, Beadlily

Clintonia uniflora

Family - Liliaceae

Range: Throughout the Pacific Northwest.

Habitat: Cool, moist forests.

Look Alikes: Queen's cup leaves may be confused when the plant is not in flower. The leaves of dogtooth violets (*Erythronium grandiflorum*) and bog orchids (*Habenaria* spp.) are succulent and nonhairy.

Indicator Value: Indicates the most highly producing forested sites in Blue and Wallowa Mountains; defines ABGR/CLUN2 and ABGR/TABR/CLUN2 plant associations at mid montane elevations. Type indicator for the ABLA-PIEN/CLUN2 plant association in the subalpine.

Miscellany: The blue berry may be toxic. The plant is unpalatable. Grouse relish the fruit. The specific name "uniflora" means one-flowered.



Queen's Cup, Beadlily

Clintonia uniflora

CLUN2

Habit: Low, up to 6 inches tall, rhizomatous, perennial forb, deciduous but green until late frosts.

Leaves: Two to three basal, strap-like, oblong, up to 6 inches long, leaves with entire margins; green and glabrous above; long silvery hairs beneath and on margins of leaves.

Flowers: White, solitary, showy, 3/4-1 inch wide, bell-shaped (Flowers: June - July).

Fruits: Solitary, deep lustrous blue berry.



Turpentine Cymopterus

Cymopterus terebinthinus
var. *foeniculaceus*

CYTEF

Family - Apiaceae

Range: Central Idaho, western Montana, northeast Oregon, southeast Washington to the Ochoco Mountains of east-central Oregon.

Habitat: Dry, rocky, open slopes.

Look Alikes: Desert parsleys (*Lomatium* spp.) - leaves pale, glaucous, or bright green; dorsal ribs of fruit not winged; odor often unpleasant.

Cymopterus - leaves dark green; fruit with dorsal wings; pleasant aromatic odor. *Lomatium grayi* - leaves glaucous; *Cymopterus* - leaves dark green.

Indicator Value: Defines linanthastrum-cymopterus (LINU4-CYTEF) talus communities, eroded ridgetop communities (PHLOX-CYTEF), and the Idaho fescue-bluebunch wheatgrass-cymopterus (FEID-AGSP-CYTEF) plant association. Common beneath sagebrush (ARTRV/CAGE2, ARAR/FEID-AGSP), mountain-mahogany (CELE3/FEID-AGSP), and with mountain snowberry (SYOR2).



Turpentine Cymopterus

Cymopterus terebinthinus
var. *foeniculaceus*

CYTEF

Habit: Perennial with taproot; glabrous; pleasantly aromatic.

Stem: Short, up to 24 inches tall, from a branched caudex. Stem base contains leaf bases from previous years.

Leaves: Many, mostly basal; blade - 1-7 inches long and nearly as wide; dissected into many small segments (ternate-pinnate); "parsley-like."

Flowers: Umbel with unequal rays; no involucre; flowers - yellow (Flowers: June - July).

Fruit: Ovoid to oblong schizocarp (1/4-3/8 inch long) with thin lateral wings.



Scabland Fleabane

Erigeron bloomeri

Family - Asteraceae

ERBL

Range: Central Washington, eastern Oregon; Idaho to central Nevada and central California.

Habitat: Dry, rocky, gravelly ridges; exposed sites; sandy passes and saddles.

Look Alikes: Other *Erigerons* at high elevations. *E. compositus* - leaves highly dissected (fern-like). *E. peregrinus* - leaves ascend the stem; purple.

Note: Always use leaves to differentiate *E. compositus* from *E. bloomeri* as *E. compositus* may lack ray flowers and appear to be *E. bloomeri*.

Indicator Value: A component of fellfields, rocky outcrops, and scree. Common in Idaho fescue communities (FEID-AGSP-CYTEF, FEID-AGSP-FRALC2, FEID-GETR) and in Sandberg's bluegrass - lanceleaved stonecrop (POSA12-SELA) communities.



Scabland Fleabane

Erigeron bloomeri

ERBL

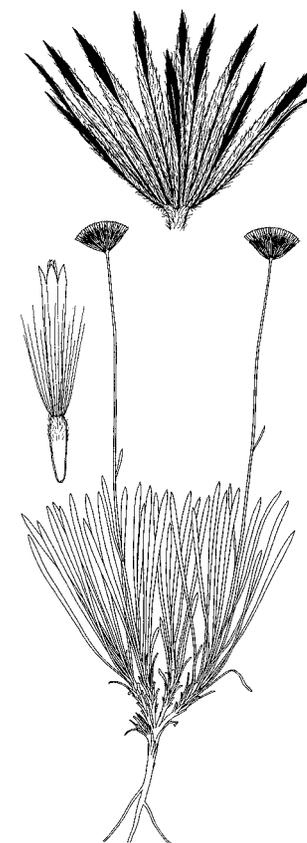
Habit: Perennial with a taproot off a much-branched caudex.

Stem: Numerous, 2-6 inches tall; white hairy.

Leaves: All basal, linear, 1-2.75 inches long.

Flowers: Head, solitary, involucre 1/4-3/8 inch high and hairy; ray flowers absent; disk flowers - yellow (Flowers: June - August).

Fruit: Achene. Pappus with bristles (25-40).



Alpine Dwarf Yellow Fleabane

Erigeron chrysopsidis

ERCHB

Family - Asteraceae

Range: Southeastern Washington to northern California; Snake River Plains in Idaho (*E. chrysopsidis* var. *brevifolius* - an endemic to high elevations in Wallowa Mountains).

Habitat: Dry, sandy to gravelly grasslands, scablands and shrublands (*E. chrysopsidis* var. *brevifolius* - rocky exposures, slides, slopes in subalpine and alpine).

Look Alikes: Yellow woolly daisy (*Eriophyllum lanatum*) - involucre bracts in one series, all equal; leaves lobed, pinnatifid; desert yellow daisy (*Erigeron linearis*) - stem and leaf hairs few to appressed; plant gray-green. Woolly goldenweed (*Haplopappus lanuginosus*) - leaves with long, tangled soft hairs; lanceolate involucre bracts.

Indicator Value: The variety *brevifolius* is found in alpine cushion plant communities (fellfields, scree, turf) in the Wallowa Mountains.



Alpine Dwarf Yellow Fleabane

Erigeron chrysopsidis

ERCHB

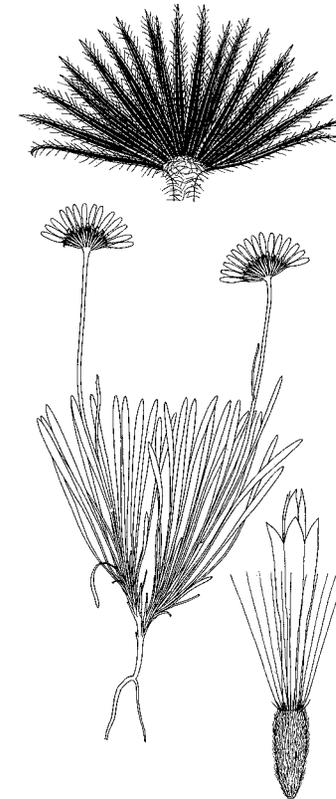
Habit: Perennial forb, taproot off a branched caudex, 1-6 inches tall.

Stems: Closely tufted with spreading hairs.

Leaves: Basal, linear-oblongate, narrow, 1-3 mm wide, up to 3.5 inches long; spreading hairs.

Flowers: Solitary heads, involucre hemispheric, hairy and slightly glandular; rays - yellow, up to 10 mm long; linear involucre bracts in 2 series - unequal: outer longer than inner (Flowers: May - August).

Fruits: Achene.



Cut-leaved Daisy

Erigeron compositus

Family - Asteraceae

ERCO4

Range: Greenland to Alaska; south to California, Arizona.

Habitat: Rocky, gravelly, sandy ridges; exposed sites. Found in fellfields, talus, and scree communities in the alpine.

Look Alikes: Other *Erigerons* at high elevation. *E. peregrinus* - leaves usually lanceolate, entire; not dissected. Purple rays. *E. bloomeri* - leaves linear, basal; rayless.

Cut-leaved daisy, with highly dissected leaves, is distinctive and readily differentiated from other daisies.

Indicator Value: A component of fellfields, scree, and rocky outcrop communities. When found in deeper soil on other alpine and subalpine sites it may indicate past disturbance. Aggressive colonizer on overgrazed sites.

Miscellany: Our variety is *glabratus* in the alpine. The specific name *compositus* refers to the finely divided leaves.



Cut-leaved Daisy

Erigeron compositus

ERCO4

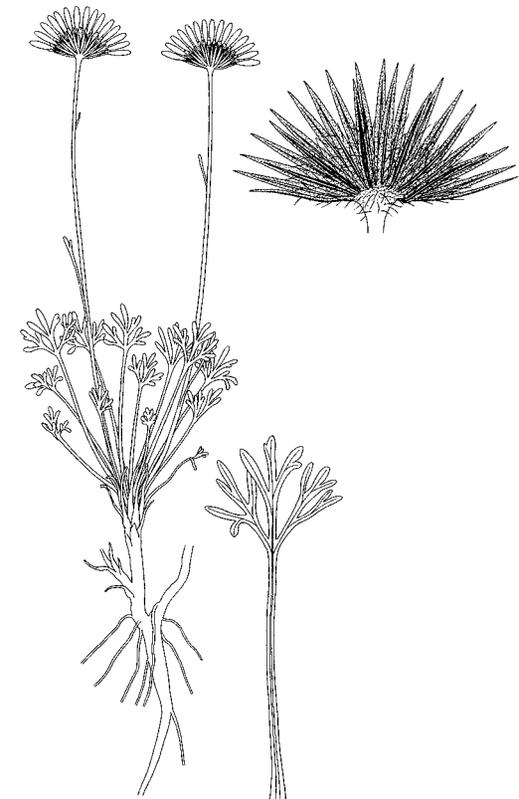
Habit: Perennial with a taproot and branched caudex.

Stem: One to several, scape-like, 4-10 inches tall. Slightly to densely hairy; often glandular.

Leaves: Basal - ternately dissected, up to 3 inches long; "fern-like" or "fan shaped." Cauline - linear, few, reduced upwards, entire.

Flowers: Head - solitary. Involucre - about 3/8 inch high, pubescent, glandular; bracts in one series; ray flowers - white (pink to bluish tinge), 20-60 in number; rays may be short 1/8-1/2 inch or absent; disk flowers - yellow (Flowers: June - August).

Fruit: Achene with pappus (12-20 simple bristles).



Subalpine Daisy

Erigeron peregrinus

Family - Asteraceae

ERPE3

Range: British Columbia to Alberta in the Rockies; south in the mountains to California, Utah, New Mexico.

Habitat: Moist meadows, streamsides, open forest at moderate to high elevations in the mountains.

Look Alikes: Resembles an aster. Asters (*Aster* spp.) have leafy involucre bracts which are unequal, overlapping. Daisies (*Erigeron* spp.) have nonleafy involucre bracts which are equal in a series or row. Eaton's daisy (*E. eatonii*) - rays white to light blue; rays narrower; showy daisy (*E. speciosus*) - stem leaves numerous; basal leaves few; rays blue.

Indicator Value: The common daisy of the subalpine in the inland Pacific Northwest. Found in subalpine fir plant associations (ABLA/VASC, ABLA/VASC-PHEM, ABLA-PIAL/VASC/ARCO9, and ABLA-PIEN/LEGL), whitebark pine plant communities, and alpine meadow communities. Increases with surface disturbance on lake shores and beneath trees where animals and people trample the ground. Increaser from overgrazing in meadows.



Subalpine Daisy

Erigeron peregrinus

ERPE3

Habit: Perennial forb up to 28 inches tall; fibrous rooted from a short rhizome.

Stems: Leafy to leafless, 8-28 inches tall.

Leaves: Basal leaves simple, entire, oblanceolate on petiole; cauline leaves reduced progressively upward, ovate to linear, usually clasping.

Flowers: Heads - solitary or few; disk flowers - yellow, 10-25 mm wide; ray flowers, 30-80, purple to rose-purple, 8-25 mm long (Flowers: July - August).

Fruits: Achene (5 nerved).



Golden Buckwheat

Eriogonum flavum

Family - Polygonaceae

Range: British Columbia to southern Alberta southward east of the Cascades through eastern Washington, northeast Oregon, south central Idaho to Colorado.

Habitat: Open, dry ridges in grasslands to alpine ridges.

Look Alikes: Other buckwheats which may be confused with golden buckwheat are: heart-leaved buckwheat (*Eriogonum compositum*) - leaves triangular or heart-shaped; golden buckwheat (*E. chrysops*) and cushion buckwheat (*E. caespitosum*) have inflorescences in head-like clusters; sulfur buckwheat (*E. umbellatum*) - leaves short petioled (up to 1.5 inches long).

Indicator Value: Especially prominent in higher elevation communities of subalpine Idaho fescue (FEID-AGSP, FEID-CAHO5, FEID-DAIN-CAREX) and green fescue (FEVI-CARO5, FEVI-LULA3, FEVI-STOC2). Common in mountain big sagebrush communities - especially ARTRV/CAGE2. Increases with surface erosion resulting from past overgrazing.

Miscellany: The flower heads are grazed by mountain sheep, mountain goats, elk, deer and horses. Blue grouse eat the foliage.



Golden Buckwheat

Eriogonum flavum

ERFL4

Habit: Caespitose perennial; prostrate to ascending from a branched crown and a stout woody taproot; matforming.

Stems: Grayish hairy with tangled woolly hairs.

Leaves: Subglabrous; green above, white or gray hairy beneath; crowded; linear, entire, 1-4 inches long; elliptic to oblanceolate; on long petioles.

Flowers: Scape with a simple umbel; rays up to 1 inch long; subtended by 4-6 leaflike bracts. Involucres densely hairy; flowers yellow, sometimes tinged pink to red, long hairy. Stipe at base (Flowers: late June - August).

Fruits: Pubescent achene.



Creamy Buckwheat

Eriogonum heracleoides

ERHE2

Family - Polygonaceae

Range: British Columbia southward on east side of Cascades to northeast California; east to western Montana, Wyoming, Utah and Nevada.

Habitat: Dry, rocky, gravelly slopes and ridges in sagebrush desert, grasslands, ponderosa pine forests to rocky montane ridges at about 7,000 feet. Not a scabland dweller - requires deep soils.

Look Alikes: Creamy buckwheat may be confused with other white flowered buckwheats having a mid whorl on the flowering stalk. Thyme-leaf buckwheat (*Eriogonum thymoides*) - flowering stem less than 4 inches tall; 1 involucre; Douglas' buckwheat (*E. douglasii*) - flowering stem less than 4 inches tall.

Indicator Value: Common in green fescue and subalpine Idaho fescue grasslands (FEID-AGSP-CYTEF, FEID-CAHO5); mountain snowberry communities; Hood's sedge communities (CAHO5-BRCA5); alpine fleecflower communities; and mountain big sagebrush communities (ARTRV/CAGE2, ARTRV/FEID-AGSP, ARTRV-SYOR2/BRCA5). Increases with overgrazing - forming large mats on ridgetops and on slopes with deep soils.

Miscellany: Seeds used by chipmunks and mice. Grazed by domestic sheep, deer and elk.



Creamy Buckwheat

Eriogonum heracleoides

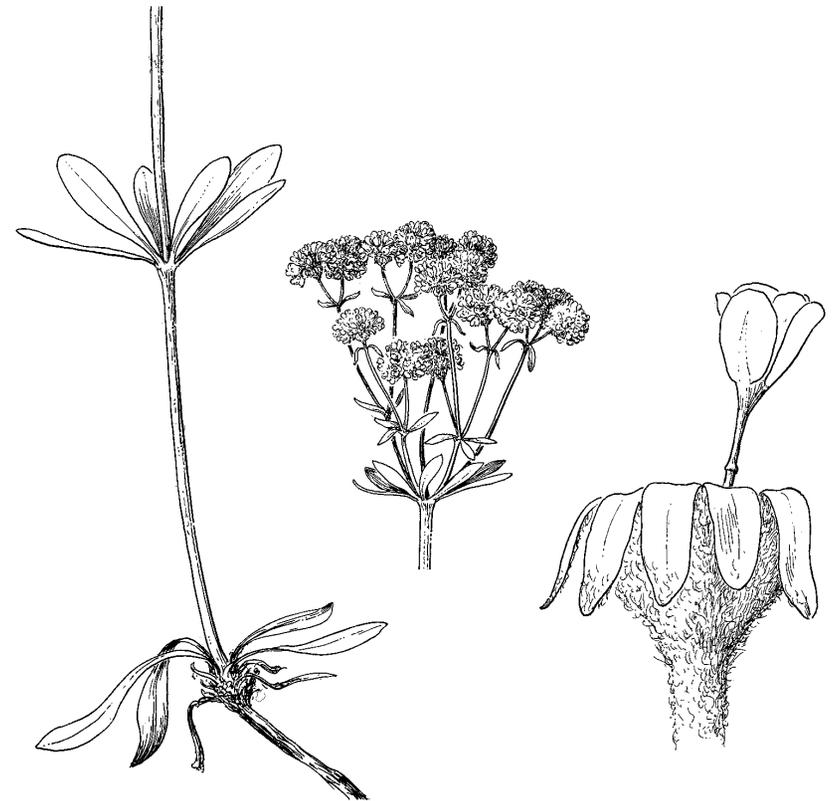
ERHE2

Habit: Freely branched perennial forb from a woody base; forms large clumps.

Leaves: Linear to oblanceolate, 1-3 inches long, dense gray hairy beneath, greenish above.

Flowers: Flower stalk, 4-28 inches tall with mid whorl of leafy bracts at mid length; umbrella-like compound umbel subtended by leaf-like bracts; involucre woolly; flowers white to creamy, sometimes rose-tinted before opening; stipe at base of perianth (Flowers: May - July).

Fruits: Pubescent achene.



Oval-leaved Buckwheat

Erigonum ovalifolium var. *nivale*

EROVN

Family - Polygonaceae

Range: Cascade Mountains - southern British Columbia, through Washington and Oregon. Sierra Nevada of California; Olympic Mountains of Washington; Wallowa Mountains southward to Nevada.

Habitat: Alpine ridges, talus slopes.

Look Alikes: Other buckwheats of alpine environments. *E. flavum* - leaves linear (1-4 inches long); flowers sulfur yellow. *E. sphaerocephalum* - leaves on flowering stem; flowers in dense round clusters. *E. heracleoides* - leaves on flowering stem in a whorl at the middle.

Indicator Value: Alpine landscapes - fellfields, scree, rocky outcrop, turf, and grus communities. A component of phlox-ivesia (PHLOX-IVGO) and Idaho fescue - Wallowa penstemon (FEID-PESP2) communities.

Miscellany: The hairiness of the leaves and scape (flowering stem) protect the plant from intense solar radiation and desiccating winds. The specific name *ovalifolium* refers to the oval-shaped leaves.



Oval-leaved Buckwheat

Erigonum ovalifolium var. *nivale*

EROVN

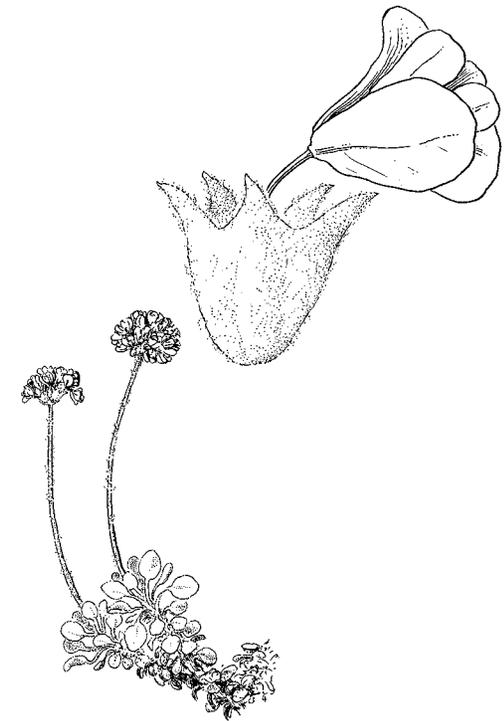
Habit: Perennial, mat-forming, taproot, dwarfed by alpine exposure.

Stem: Leafless scape, less than 3 inches tall; densely hairy.

Leaves: All basal, spatulate, blades rhombic, oval, or oblanceolate, 1/4-5/8 inch long and wide; silvery or white from dense hairiness on both sides of leaves.

Flowers: Congested cluster of several involucre up to 1.5 inches wide; umbellate; subtended by 3 or more linear-lanceolate bracts; involucre woolly-hairy; perianth white (cream color) to pale yellow (pinkish or purplish-tinged with age) (Flowers: July - August).

Fruit: Achene.



Woolly Eriophyllum

Eriophyllum lanatum

Family - Asteraceae

ERLA6

Range: British Columbia to California, east to western Montana, south to western Wyoming and Utah.

Habitat: Dry, open rocky or sandy slopes.

Look Alikes: Other yellow composites in the subalpine. *Erigeron chrysopsidis* - leaves linear. *Haplopappus lanuginosus* - leaves lanceolate to linear. *Arnica* species - leaves opposite.

Indicator Value: In the subalpine, this plant is commonly found with mountain big sagebrush (ARTRV/CAGE2, ARTRV/BRCA5, ARTRV/FEID-AGSP), Idaho fescue (FEID-AGSP-CYTEF), green fescue (FEVI-GETR), phlox-cymopterus (PHLOX -CYTEF), and mountain balm (MOOD) talus communities.

Miscellany: Highly adapted to dry sites with high exposure. The matted woolly hairs covering stem and leaf reduce water loss. *Eriophyllum* means "woolly leaf" in Greek; *lanatum* means "woolly" in Latin.



Woolly Eriophyllum

Eriophyllum lanatum

ERLA6

Habit: Perennial, white - woolly.

Stem: Several basal stems from a woody base; thick-stemmed, hairy, 4-10 inches tall.

Leaves: Alternate, entire and toothless often with 3-lobed tips 1/2-3 inches long; woolly beneath - glabrous above.

Flowers: Solitary head on long peduncle; 8-12 rays - golden yellow, 1/2-3/4 inch wide; disc - yellow; involucre up to 1/2 inch high; involucre bracts in one series (Flowers: June - July).

Fruit: Achene; pappus of translucent scales.



Alpine Forget-Me-Not

Eritrichium nanum

ERNA

Family - Boraginaceae

Range: Rocky Mountains of the U.S. from Montana to northern New Mexico including the Wallowa Mountains of northeast Oregon. Also found in the Alps of Europe, Asia, Alaska, and the Yukon.

Habitat: Alpine rocky sites.

Look Alikes: Singular if flowering. *Hackelia* (stickseeds) have similar blue flowers but plants are subalpine (over 12 inches tall).

Indicator Value: One of the “cushion plants” occupying fellfield and turf communities.

Miscellany: A “floral gem” in the alpine landscape. Blooms like phlox with flowers covering cushions as a continuous color of blue with yellow “eyes.” *Eritrichium* means woolly hairs in Greek.



Alpine Forget-Me-Not

Eritrichium nanum

ERNA

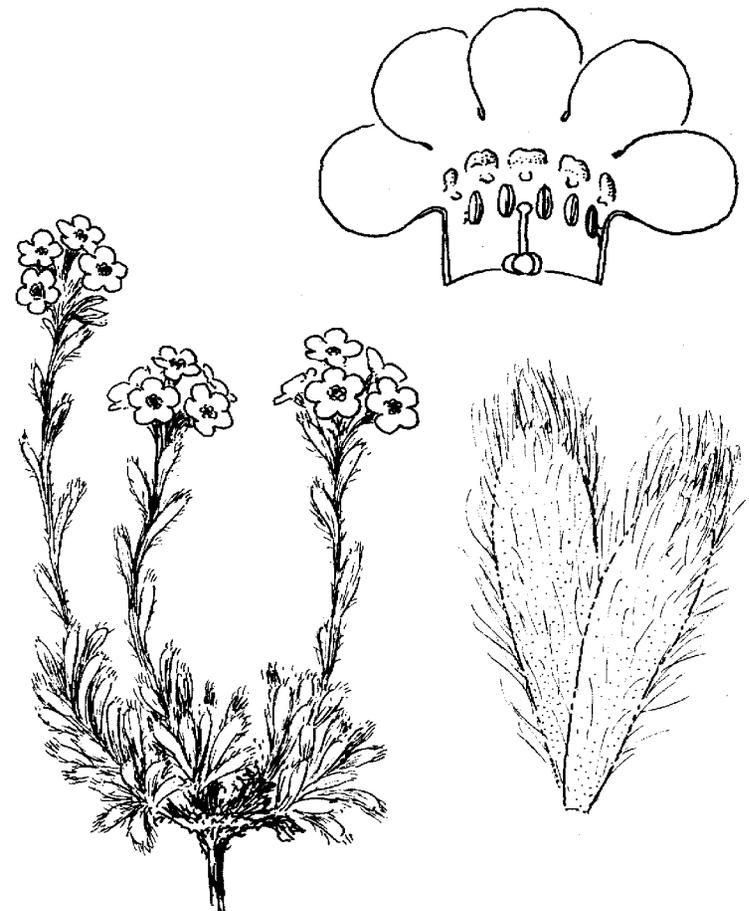
Habit: Perennial from a branched caudex, caespitose, cushion-like, mat-forming.

Stem: Erect, slender, up to 2.5 inches tall, long-white scattered hairs.

Leaves: Mostly basal, oblong to ovate, up to 3/8 inch long; long hairy and tufted at leaf tip.

Flowers: Bright blue with yellow throat or “eye”; 5-lobed corolla; inflorescence a terminal cyme-like cluster (Flowers: July - August).

Fruit: Nutlets (1-4).



White Stemmed Frasera

Frasera albicaulis

Family - Gentianaceae

FRAL2

Range: Southern British Columbia to Nevada and California; east to Idaho and western Montana.

Habitat: Open, grassy to sandy ridges in subalpine environments.

Look Alikes: Other subalpine gentian family plants. *Gentiana* (gentians)-corolla over 3/4 inch long; tubular, funnel-like corolla. *Frasera* - corolla not funnel-shaped; rotate and under 3/4 inch long.

Indicator Value: Type indicator for the Idaho fescue - bluebunch wheatgrass - white stemmed frasera (FEID-AGSP-FRAL2) plant association.

Miscellany: Subalpine varieties of *Frasera albicaulis* can be var. *albicaulis*, var. *cusicki*, or var. *idahoensis*.



White Stemmed Frasera

Frasera albicaulis

FRAL2

Habit: Perennial, several stems from a branched caudex.

Stem: Glabrous, 8-20 inches tall.

Leaves: Basal - linear; oblanceolate to spatulate, 2-12 inches long; 3 prominent leaves, "white margins." Cauline - opposite, reduced upward.

Flowers: Cymose (congested to open): calyx - white margined; corolla pale blue to blue-white (Flowers: June - July).

Fruit: Capsule.



Sweetscented Bedstraw

Galium triflorum

Family - Rubiaceae

GATR3

Range: Circumboreal; throughout Pacific Northwest.

Habitat: Cool, moist forested communities at mid to high elevations.

Look Alikes: Differentiate from other bedstraws as follows: northern bedstraw (*Galium boreale*) - perennial, many flowered, four leaves per whorl; cleavers (*G. aparine*) - annual, several flowered, 6 to 8 leaves per whorl.

Indicator Value: Common at low coverages beneath subalpine fir and Engelmann spruce.

Miscellany: Roasted and ground seeds are coffee substitute. Purple dye from roots. Common name "bedstraw" from use of plant in mattress ticking. The specific name "*triflorum*" refers to three-flowered inflorescences.



Sweetscented Bedstraw

Galium triflorum

GATR3

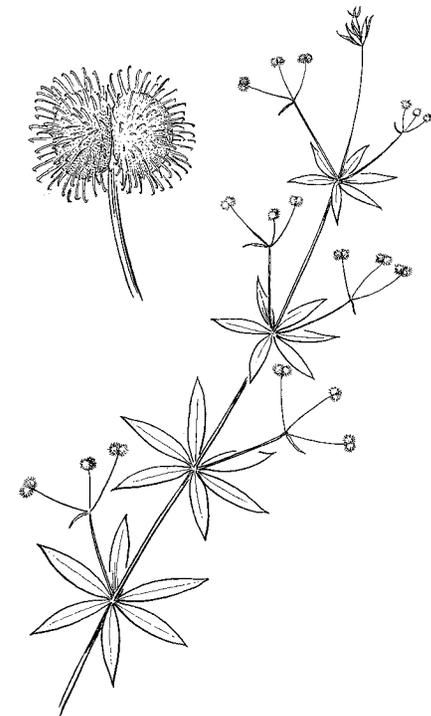
Habit: Deciduous, perennial trailing forb, creeping rhizomes.

Stem: Square, retrorse hairs on angled edge - or glabrous.

Leaves: Sessile in whorls of 6; elliptic, entire, up to 2 inches long.

Flowers: Small, white, 4-merous; borne in threes from peduncles at leaf axils (Flowers: June - August).

Fruit: Capsule covered with hooked bristles.



Red Avens; old man's whiskers

Geum triflorum

Family - Rosaceae

GETR

Range: British Columbia southward on east side of Cascades to Sierras of California; eastward to New York; south in the Rockies to Nevada, Utah and New Mexico.

Habitat: Meadows, moist grasslands, moist areas in sagebrush plains and lower foothills to subalpine ridges.

Look Alikes: The only *Geum* with opposite stem leaves at mid length. Geranium leaves may appear similar but are glabrous. Some potentilla leaves may appear similar but are not wider near the tip nor tapering to the base as are red avens leaves.

Indicator Value: An increaser in moist, deep soils where Idaho fescue grasslands and mountain big sagebrush occur (ARTRV/FEID-AGSP, ARTRV/CAGE2). Type indicator for the Idaho fescue/red avens (FEID-GETR) plant community type.

Miscellany: Native Americans boiled roots to make a tea.



Red Avens; old man's whiskers

Geum triflorum

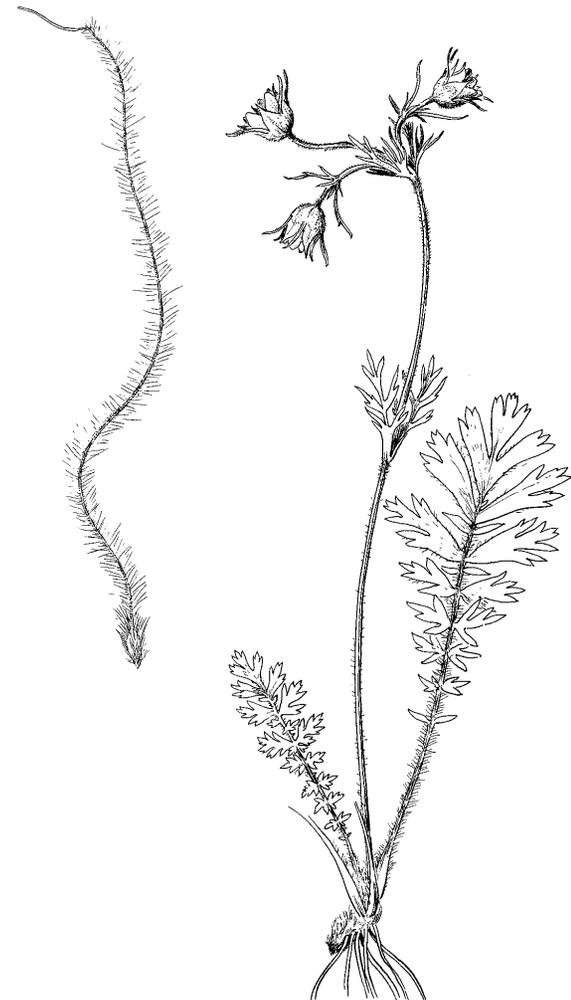
GETR

Habit: Perennial forb from thick, scaly rootstock covered with old leaf bases, clump-forming, 12-20 inches tall.

Leaves: Basal, blades, 2-6 inches long; obovate, pinnate to pinnatifid, unequal, grayish with long hairs.

Flowers: Flowery stem up to 12 inches tall with reduced opposite leaves in whorl at mid length; cyme with nodding flowers usually in 3's; calyx reddish purple to pink; petals white, yellow to pinkish or purplish-red, hidden behind bracteoles of the calyx; style strongly featherlike (Flowers: April - July).

Fruits: Achene with long feathery style ("old man's whiskers").



Rattlesnake Plantain

Goodyera oblongifolia

Family - Orchidaceae

GOOB2

Range: Western and northern United States.

Habitat: Warm, moist to cool, moist forested sites in true fir series vegetation; tends to occupy needle-littered surfaces beneath dark, closed tree overstories.

Look Alikes: Readily recognized.

Indicator Value: Commonly found in later seral true fir plant communities associated with big huckleberry (TSME/VAME, ABLA/VAME, ABGR/VAME) and beneath Engelmann spruce (ABLA-PIEN) communities.

Miscellany: Yes, this really is an orchid! The spikelike inflorescence resembles rattles on a rattlesnake. Plant is nonpalatable.



Rattlesnake Plantain

Goodyera oblongifolia

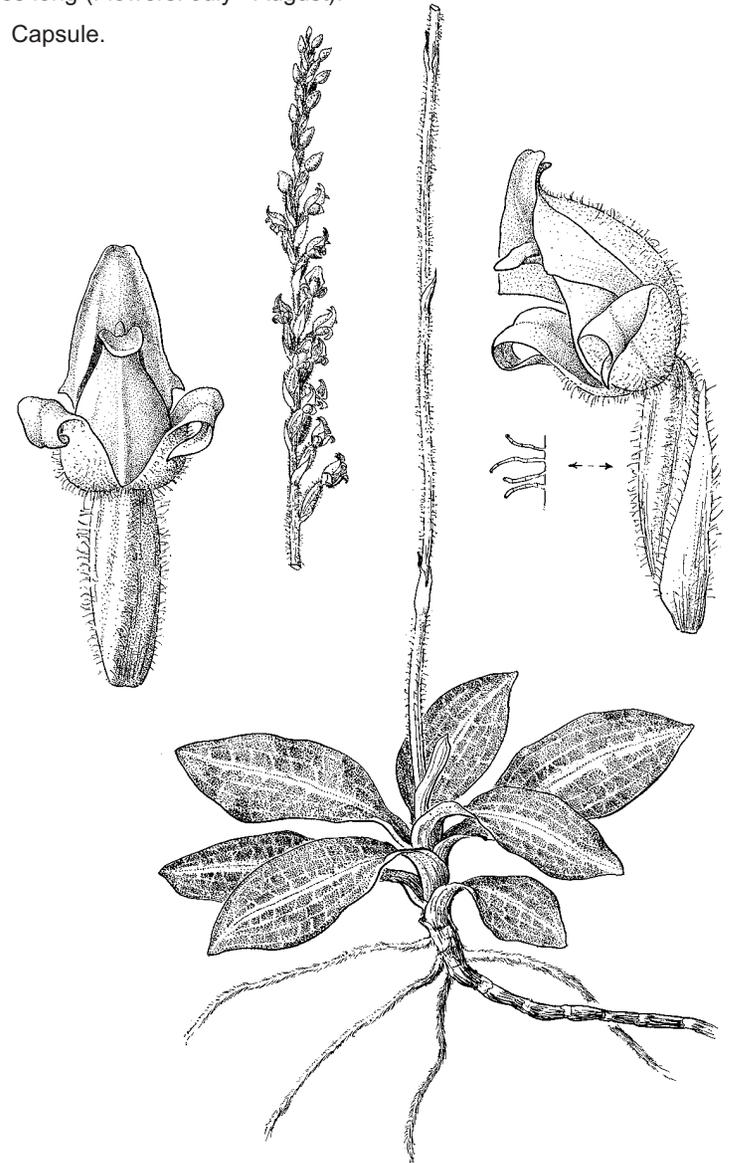
GOOB2

Habit: Perennial, evergreen forb up to 12 inches tall, short rhizomes.

Leaves: Basal rosette, thick, entire, elliptic-lanceolate, 1-3 inches long; white stripe along midrib.

Flowers: Small, inconspicuous, green, hooded, 3-merous; borne in spike, 4 inches long (Flowers: July - August).

Fruit: Capsule.



Blue Stickseed

Hackelia jessicae (*H. micrantha*)

Family - Boraginaceae

Range: Southern British Columbia south along Cascades to Sierra Nevada, eastward to Alberta, Montana, western Wyoming and Utah.

Habitat: Forest openings, streambanks, open slopes, and meadows in the subalpine.

Look Alikes: Other tall (over 12 inches) borage family plants in the subalpine. *Mertensia* (bluebells) - flowers on long pedicels; corolla tube longer than calyx. *Hackelia* (stickseeds) - flowers on short stalks; corolla tube short.

Indicator Value: Commonly occurs in quaking aspen/elk sedge (POTR5/CAGE2), mountain big sagebrush-linanthastrum (ARTRV/LINU4), Hood's sedge - mountain brome (CAHO5-BRCA5), and Hood's sedge-elk sedge (CAHO5-CAGE2) communities. Found in green fescue communities - especially with Hood's sedge (FEVI-CAHO5). Close affinity with mountain snowberry (SYOR2, PSME/SYOR2/CAGE2).

Miscellany: Bristles stick to fur of animals to aid in dissemination. This stickseed is also known as Jessica's stickseed (*H. jessicae*) in local and regional floras.



Blue Stickseed

Hackelia jessicae (*H. micrantha*)

HAJE

Habit: Perennial, taproot off a branched caudex.

Stem: Several, 12-36 inches tall; thickened at the base, stiff, coarse hairs.

Leaves: Alternate, basal - elliptic to oblanceolate on petiole; cauline - oblanceolate below; reduced and sessile above.

Flowers: Raceme of few flowers. Corolla blue with a yellow "eye"; corolla tube about 3/8 inch across and 1/4 inch high; 5-lobed (Flowers: June - August).

Fruit: Nutlet - ovate with large marginal prickles on the edges and numerous smaller prickles on sides of nutlet.



Woolly Goldenweed

Haplopappus lanuginosus

HALA3

Family - Asteraceae

Range: Central Washington, eastern Oregon, Idaho, western Montana.

Habitat: Dry, rocky to gravelly sites on exposed ridges and slopes.

Look Alikes: Other yellow composites in the subalpine. *Eriophyllum lanatum* - leaves usually lobed; involucre bracts in one series. *Erigeron chrysopsidis* - leaves linear; involucre bracts in more than one series; heads small; involucre 3/8 inch high. *Arnica* species - leaves opposite. *Haplopappus lanuginosus* - leaves unlobed, involucre bracts subequal; heads larger; involucre 1/2 inch high.

Indicator Value: Frequently in low sagebrush/Idaho fescue-bluebunch wheatgrass (ARAR/FEID-AGSP) plant associations. Also found in Idaho fescue-red avens (FEID-GETR), Idaho fescue-bluebunch wheatgrass-Cusick's fraseria (FEID-AGSP-FRALC2), and mountain big sagebrush-elk sedge (ARTRV/CAGE2). In the alpine it occurs in fellfields, scree, and on rocky outcrops.



Woolly Goldenweed

Haplopappus lanuginosus

HALA3

Habit: Perennial, caespitose, mat-forming, roots are fibrous from a branched caudex.

Stem: Numerous stems, 2.25-8 inches tall, matted hairs often glandular.

Leaves: Numerous, erect, oblanceolate to linear, up to 4 inches long, soft, entire.

Flowers: Solitary heads; involucre about 1/2 inch high with subequal to equal bracts; rays - yellow (7-20), about 1/2 inch long (Flowers: June - July).

Fruit: Achene with white pappus.



Western Hawkweed

Hieracium albertinum

Family - Asteraceae

Range: Eastern Washington to northeast Oregon, central Idaho and western Montana.

Habitat: Grassy steppe extending into warm, dry forest sites at lower elevations.

Look Alikes: Readily confused with white flowered hawkweed (*Hieracium albiflorum*) when the white flowers are absent. White flowered hawkweeds are less hairy; lower leaves long, petiolate.

Indicator Value: Strong affinities to elk sedge. Wide ranging in the subalpine from whitebark pine (PIAL/CAGE2), subalpine fir (ABLA-PIAL/CAGE2, ABLA/VASC, ABLA/VAME), mountain big sagebrush (ARTRV/CAGE2, ARTRV/FEID-AGSP), mountain snowberry, elk sedge, Hood's sedge and alpine fleecflower communities.

Miscellany: Palatable to sheep, deer, and elk. Increases slightly with disturbance. Not aggressive. Used as source of chewing gum by Native Americans. The species name "*albertinum*" relates to Alberta, Canada.



Western Hawkweed

Hieracium albertinum

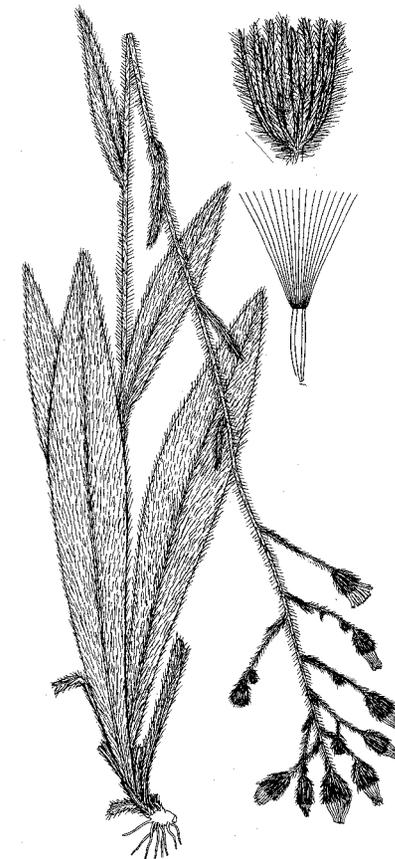
HIAL

Habit: Deciduous, short, 10-20 inches, perennial forb, densely pubescent with long spreading white hairs, milky sap throughout plant.

Leaves: Lower leaves elongated without petiole; middle and upper cauline leaves reduced and sessile; alternate, entire margins; long hairy.

Flowers: Yellow, heads few to many, involucre densely hairy with stellate hairs (Flowers: July - August).

Fruit: Achene.



White Hawkweed

Hieracium albiflorum

Family - Asteraceae

Range: Widespread throughout the Pacific Northwest.

Habitat: Douglas-fir to subalpine fir communities at cool, moist, mid elevations in the mountains.

Look Alikes: Readily confused with western hawkweed (*Hieracium albertinum*) when the yellow flowers are absent. Western hawkweed stems and leaves are long hairy; lower leaves sessile to short petiolate.

Indicator Value: More mesic sites than where western hawkweed occurs. Common in grand and subalpine fir series vegetation with an affinity to huckleberries (ABGR/VAME, ABLA/VAME, ABLA/VASC). Also occurs in ABLA/ARCO9, ABLA-PIEN/CLUN and TSME/VASC.

Miscellany: Palatable to sheep, deer, and elk. Used as source of chewing gum by Native Americans.



White Hawkweed

Hieracium albiflorum

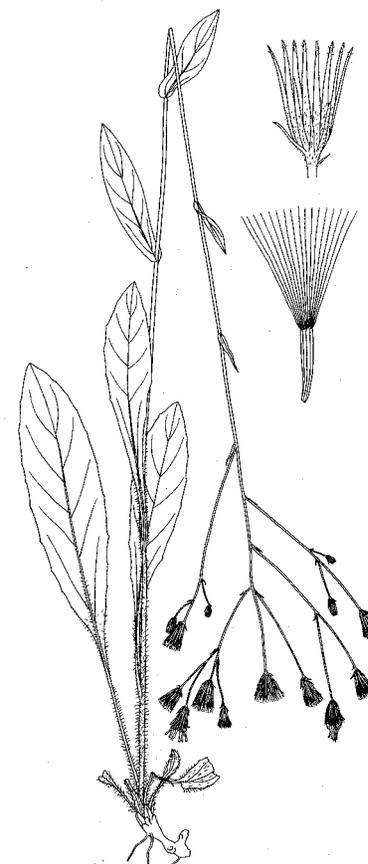
HIAL2

Habit: Deciduous, medium, 12-30 inches, perennial forb; long, scattered pubescence at plant base to glabrous above; milky sap throughout plant.

Leaves: Lower leaves elliptic; petiolate; middle and upper cauline leaves reduced and sessile; alternate; margin entire to wavy.

Flowers: White, heads few to many, involucre glabrous to hairy; blackish-green color with stellate hairs (Flowers: June - August).

Fruit: Achene.



Alpine Hulsea

Hulsea algida

Family - Asteraceae

Range: Wallowa Mountains to southwest Montana and Wyoming; northeast Nevada; Sierra Nevada Mountains.

Habitat: Favors steep slopes comprised of granitic sands; scree and talus near treeline.

Look Alikes: Other yellow, hairy composites in subalpine/alpine environments. *Haplopappus* species - pappus of bristles (*Hulsea* has no pappus). *Hulsea nana* - plants under 4 inches tall; floral stem leafless. *Hulsea algida* - plants taller than 4 inches; floral stem with some leaves.

Indicator Value: Indicator of grass communities.

Miscellany: The species name "*algida*" means cold - referring to its habitat.

HUAL



Alpine Hulsea

Hulsea algida

HUAL

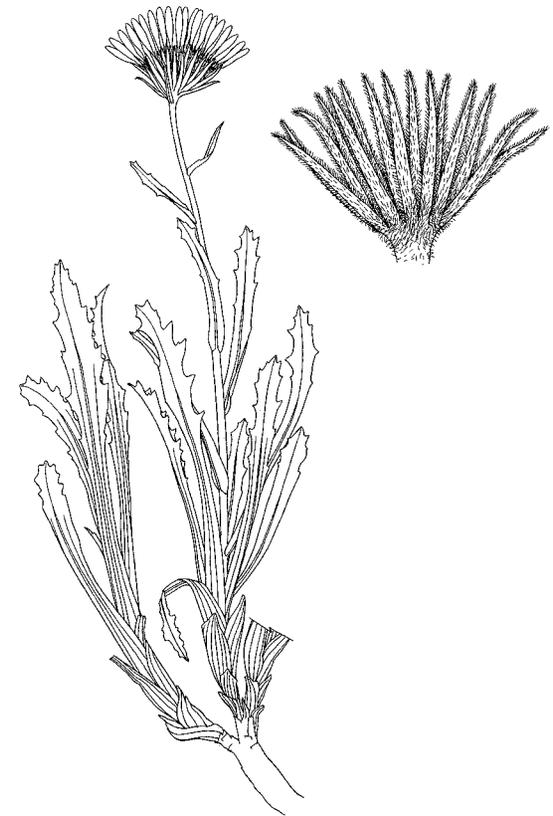
Habit: Perennial with thick taproot off a branched caudex.

Stem: Several, densely long - hairy, glandular, 4-10 inches tall.

Leaves: Basal - erect oblanceolate, pinnately lobed to shallowly toothed, petiolate, up to 6 inches long; cauline - sessile, linear, reduced upward.

Flowers: Solitary large head, 2-3 inches across; involucre up to 3/4 inch high - glandular, woolly hairy; rays (25-55) bright yellow; over 1/2 inch long (Flowers: July - September).

Fruit: Achene.



Gordon's Ivesia

Ivesia gordonii

IVGO

Family - Rosaceae

Range: Wallowa and Blue Mountains eastward through central Idaho to western Montana. South to Wyoming, Utah, and northeast Colorado. Also south central Oregon to the northwest Sierra Nevada Mountains.

Habitat: Alpine and subalpine rocky and gravelly ridges; slopes; fellfields; and talus slopes.

Look Alikes: Singular with pinnatifid basal cluster of leaves and globe-like cluster of yellow flowers atop a single scape.

Indicator Value: Indicator of phlox-ivesia community type (PHLOX-IVGO) and is common in turf, scree, and fellfield communities.



Gordon's Ivesia

Ivesia gordonii

IVGO

Habit: Perennial, taproot from a simple or branched caudex.

Stem: Erect, ascending, 2-6 inches tall, scapose.

Leaves: Basal - pinnately compound, 1-3 inches long, each leaf divided into 20 or more deeply incised leaflets; each leaflet deeply cut into 3-5 segments; glandular hairy; cauline - greatly reduced, usually only one.

Flowers: Dense, hairy, glandular globose cyme; calyx yellowish; sepals - 5 alternate with petals - 5; petals - yellow, nearly as long as sepals; stamens - 5 (Flowers: July - August).

Fruit: Achene.



Dwarf Lewisia

Lewisia pygmaea

Family - Portulacaceae

Range: Olympic and Cascade Mountains of Washington - south to California; east to Montana and south to New Mexico and Arizona.

Habitat: Gravelly to rocky open ridges and slopes in subalpine and alpine environments.

Look Alikes: Other Lewisias - *L. columbiana* (several flowers per stem; flowering stems longer than leaves). *L. triphylla* (several flowers per stem; bracts beneath the inflorescence on the scape). *Claytonia* spp. - leaves occur on the stem; stamens and petals 5 in number.

Indicator Value: Defines the dwarf lewisia - cluster tarweed (LEPY2-MAGL) community type.

Miscellany: The flowers are often "hidden" beneath the numerous long leaves. The genus *Lewisia* was named for Meriwether Lewis of the Lewis and Clark Expedition. The species *pygmaea* means "dwarf."



Dwarf Lewisia

Lewisia pygmaea

LEPY2

Habit: Perennial, carrot-shaped, fleshy taproot (simple or branched).

Stem: Scape, 1-3 inches long; opposite connate bracts at mid-length.

Leaves: Basal leaves numerous; linear to oblanceolate up to 6 inches long, fleshy.

Flowers: Solitary, 1/2 inch across; sepals 2, 1/4 inch long, often glandular, green to red; petals 6-8; glandular, white to greenish-white, pink or rose colored; stamens 4-12 (Flowers: June - August).

Fruit: Capsule.



Canby's Lovage

Ligusticum canbyi

Family - Apiaceae

LICA2

Range: Cascades of Washington, east to northern Idaho, and western Montana, central Idaho, and Wallowa Mountains.

Habitat: Moist to wet meadows, streambanks, and seepy slopes in mountains.

Look Alikes: *Ligusticum grayi* - Rays of terminal umbel 7-14; plants under 20 inches tall; cauline leaves all reduced. *Perideridia* spp. (yampa) - leaflets long and narrow, few, withering at flowering.

Indicator Value: Defines the green fescue - Canby's lovage (FEVI-LICA2) plant community. Also a component of Hood's sedge (CAHO5) meadow communities.

Miscellany: Native Americans used the root as additive to tobacco for smoking; also for relief of colds.



Canby's Lovage

Ligusticum canbyi

LICA2

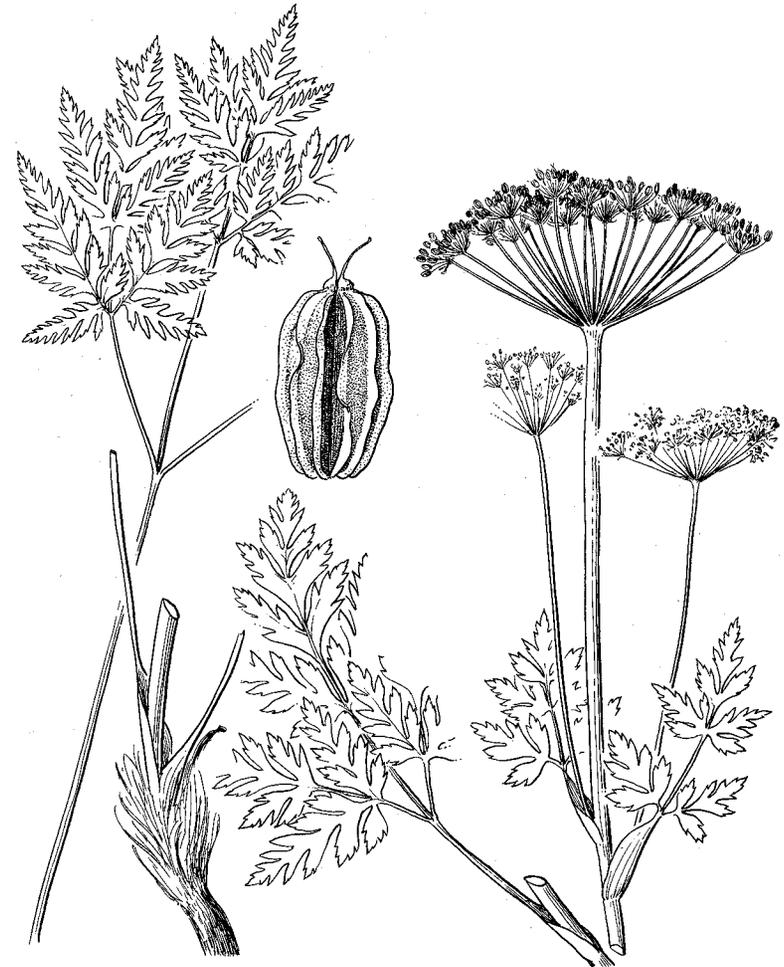
Habit: Perennial, 20-50 inches tall, fibrous roots off strong taproot.

Stem: Stout, branched above, usually glabrous.

Leaves: Ternate-pinnately compound; leaflets narrow and lanceolate, up to 2 inches long; upper cauline leaves reduced with one or more leaves well developed.

Flowers: Umbels (lateral smaller than the terminal); rays of terminal umbel 15-30, 1-2 inches long; white flowers (Flowers: June - August).

Fruit: Schizocarp (ribs narrowly winged).



Gray's Lovage

Ligusticum grayi

Family - Apiaceae

LIGR

Range: Washington Cascades to Sierras of California; east to Blue and Wallowa Mountains in Oregon; Seven Devils of Idaho.

Habitat: Moist to dry forested slopes and meadows.

Look Alikes: *Ligusticum canbyi* - rays of terminal umbel more than 15; plants over 20 inches tall; one or more leaves well developed (not reduced). *Perideridia* (yampa) - leaflets long and narrow, few; withering at time of flowering.

Indicator Value: Often associated in subalpine fir and whitebark pine stands. Occurs in the PIAL-ARAC2 plant community type and the following subalpine fir plant associations (ABLA-PIEN/LEGL, ABLA/VASC, ABLA/VASC-PHEM).



Gray's Lovage

Ligusticum grayi

LIGR

Habit: Taprooted perennial, 8-24 inches tall; unpleasant odor.

Stem: Short, glabrous, naked or with 1-2 reduced leaves.

Leaves: Basal, 4-12 inches long; ternate - pinnately compound with dissected linear leaflets; 1-2 reduced leaves.

Flowers: Umbel 1-3; rays 7-14, 3/4-1.25 inches long; white flowers (Flowers: July - September).

Fruit: Schizocarp; ribs narrowly winged.



Linanthesrum

Linanthesrum nuttallii

LINU4

Family - Polemoniaceae

Range: Cascade, Sierra, Blue and Wallowa Mountains to Rocky Mountains.

Habitat: Dry, rocky or sandy sunny slopes at high elevations to about 9,200 feet.

Look Alikes: May be confused with phloxes (*Phlox* spp.) - leaves not lobed or divided into leaflets.

Indicator Value: Occurs beneath whitebark pine (PIAL/FEVI) and subalpine fir (ABLA-PIAL/FEVI, ABLA/JUPA). Common in Wallowa Mountains on overgrazed green fescue sites (ARTRV/LINU4, FEVI-PENST, FEVI-STOC2). *Linanthesrum* community types occur on talus sites (LINU4-ARLO6, LINU4-ARLU, LINU4-CYTEF) and disturbance sites (POPH-AGUR-LINU4, POPH-CAGE2-LINU4).

Miscellany: Unpalatable.



Linanthesrum

Linanthesrum nuttallii

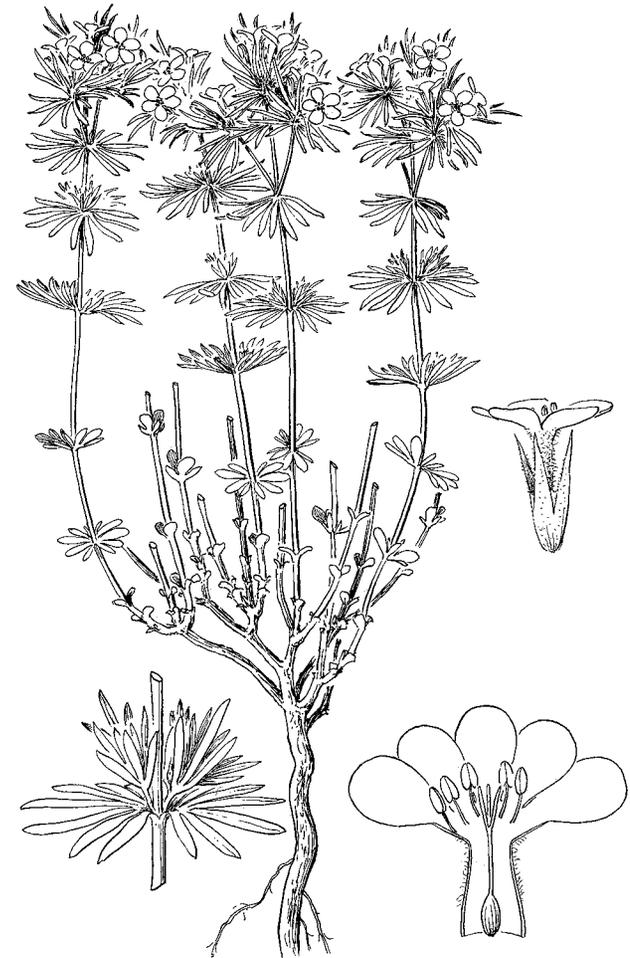
LINU4

Habit: Taprooted aromatic perennial forb arising from woody caudex, up to 12 inches tall.

Leaves: Opposite, 5-9 parted into linear segments, forming a whorl, 3/4 inch long.

Flowers: White with yellow throat born in small terminal cymes (Flowers: June - August).

Fruit: Oblong capsule.



Wild Blue Flax

Linum perenne var. *lewisii*

LIPEL2

Family - Linaceae

Range: Alaska to New Mexico (in the western conterminous states).

Habitat: Dry, well drained soil, rocky slopes and ridges, scree and talus.

Look Alikes: Without the diagnostic flowers the plant could be confused with: *Gilia congesta* with its weak stems and sprawling stems but its leaves are often trifid, pinnatifid, or palmatifid.

Indicator Value: Commonly found with mountain big sagebrush (ARTRV/CAGE2; ARTRV/FEID-AGSP) and in scree communities.

The variety *lewisii* is named for Meriwether Lewis of the Lewis and Clark Expedition. Native Americans used the fibrous stems for fishing line and cord; seeds cooked for nourishment. Excellent ornamental for gardens.



Wild Blue Flax

Linum perenne var. *lewisii*

LIPEL2

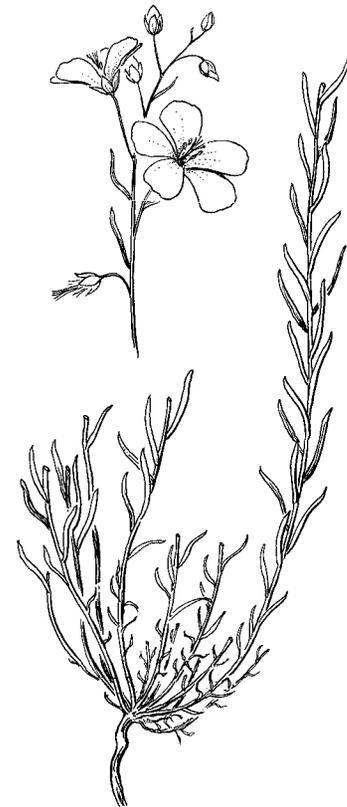
Habit: Perennial, several stems from a woody caudex.

Stem: Glabrous, slender; glaucous, 4-24 inches tall; often lax and lying prostrate.

Leaves: Alternate, linear; about 1 inch long; sessile; gray-green (glaucous).

Flowers: Pale blue to sky blue in loose racemes or panicles, 1/2-1 inch long; sepals, petals, and stamens - 5 in number; styles - 5, longer than the stamens. Flowers open in the morning and close in the afternoon (Flowers: June - July).

Fruit: Round capsule (10 celled) on curved stalks.



Cusick's Lomatium

Lomatium cusickii

LOCU

Family - Apiaceae

Range: Wallowa and Elkhorn Mountains, east across central Idaho to western Montana.

Habitat: Open subalpine forest; rocky, gravelly, and sandy ridgetops and saddles, rock outcrops, and scree.

Look Alikes: *Cymopterus* - fruit with dorsal wings; involucre asymmetrical; pleasant odor. *Lomatium* - fruit without dorsal wings; involucre symmetrical; odor often unpleasant. Other alpine lomatiums: *Lomatium grayi* - plant above 3 inches tall, rays of umbel 5-25; highly dissected leaves; yellow flowers. *Lomatium cusickii* - plant above 3 inches tall; rays of umbel 5-25; flowers white. *Lomatium oregonum* - plant under 3 inches tall; rays of umbel less than 5; flowers yellow.

Indicator Value: Occurs in whitebark pine stands (ABLA-PIAL/RIMO2/POPU3, PIAL/VASC/ARAC2), in phlox-ivesa (PHLOX-IVGO) communities, and in rock outcrop and scree communities.

Miscellany: Named for William C. Cusick (1842-1922) - pioneer botanist in the Wallowa and Blue Mountains.



Cusick's Lomatium

Lomatium cusickii

LOCU

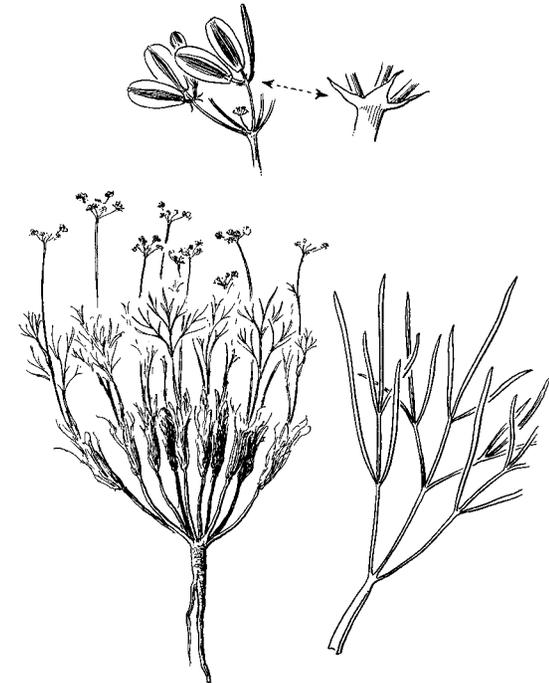
Habit: Perennial, branched caudex surmounting a taproot.

Stem: Herbage glabrous, plant about 6 inches tall.

Leaves: Basal, ternate, 2-3 times dissected into linear segments, 1/2-2.5 inches long.

Flowers: Umbel 1-2 per stem; rays 5-12; involucels of linear bractlets, broad at the base. White, purplish, or yellowish-white (Flowers: June - July).

Fruit: Schizocarp with wings narrower than body.



Gray's Desert Parsley

Lomatium grayi

Family - Apiaceae

LOGR

Range: Eastern Washington and Oregon; northern Idaho south through the Wallows, Seven Devils, and Blue Mountains to northeast Nevada; southwest Wyoming, Utah and southwest Colorado.

Habitat: Dry, rocky ridges and slopes, ledges, and crevices.

Look Alikes: *Cymopterus* - fruit with dorsal wings; involucre asymmetrical; pleasant odor. *Lomatium* - fruit without dorsal wings; involucre symmetrical; odor often unpleasant. Other alpine lomatiums: *Lomatium grayi* - plant above 3 inches tall, rays of umbel 5-25; highly dissected leaves; yellow flowers. *Lomatium cusickii* - plant above 3 inches tall; rays of umbel 5-25; flowers white. *Lomatium oregonum* - plant under 3 inches tall; rays of umbel less than 5; flowers yellow.

Indicator Value: Occurs in linanthastrum-cymopterus (LINU4-CYTEF) communities; fellfields.



Gray's Desert Parsley

Lomatium grayi

LOGR

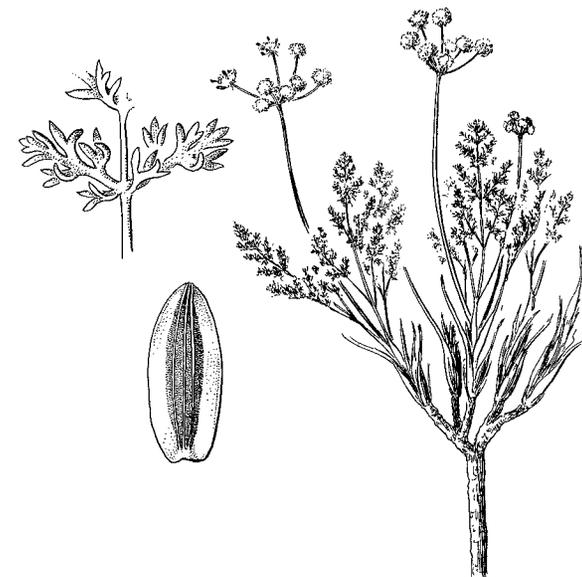
Habit: Perennial, glabrous, unpleasant odor; branched caudex with stout taproot.

Stem: Glabrous stems and scapes, 6-20 inches tall; often glaucous.

Leaves: Gray-green; ternate - pinnately basal leaves dissected into many linear, crowded segments in several planes, "parsley-like."

Flowers: Umbel; rays 7-22, up to 3.5 inches long; involucre of linear, acuminate bractlets. Yellow (Flowers: April - May).

Fruit: Schizocarp, wings 1/3-2/3 as wide as body.



Blue Mountain Lomatium

Lomatium oreganum

Family - Apiaceae

LOOR3

Range: Endemic. Wallowa and Elkhorn Mountains.

Habitat: Open rocky ridges in the alpine.

Look Alikes: *Cymopterus* - fruit with dorsal wings; involucre asymmetrical; pleasant odor. *Lomatium* - fruit without dorsal wings; involucre symmetrical; odor often unpleasant. Other alpine lomatiums: *Lomatium grayi* - plant above 3 inches tall, rays of umbel 5-25; highly dissected leaves; yellow flowers. *Lomatium cusickii* - plant above 3 inches tall; rays of umbel 5-25; flowers white. *Lomatium oreganum* - plant under 3 inches tall; rays of umbel less than 5; flowers yellow.

Indicator Value: Occupies fellfield and scree communities.



Blue Mountain Lomatium

Lomatium oreganum

LOOR3

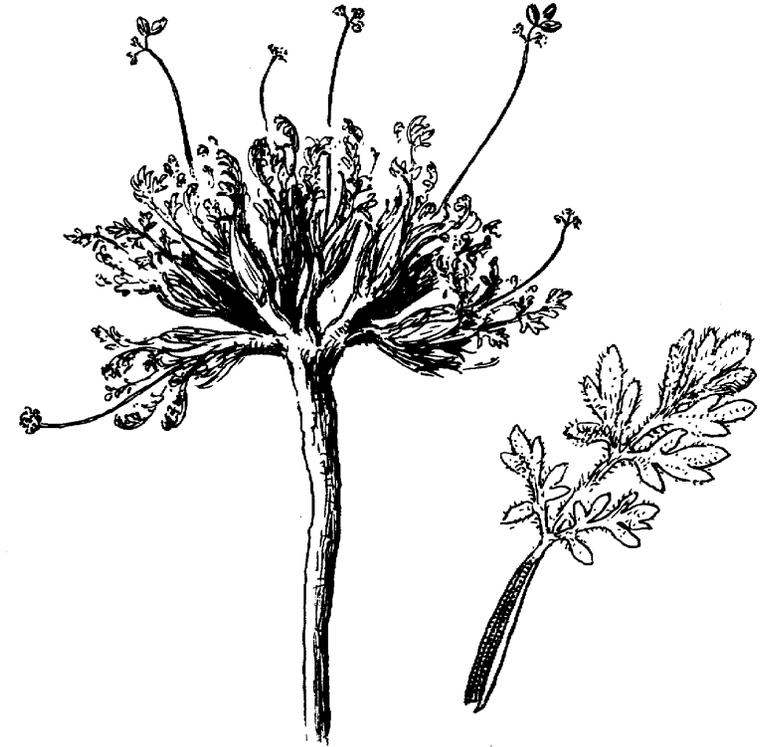
Habit: Cespitose, dwarf, with a branching caudex and taproot.

Stem: Slender scapes, 3/4-2.25 inches long.

Leaves: All basal, pinnately to ternate - pinnately compound.

Flowers: Yellow, small, compact umbel; rays few, under 5, and short. Involucre of narrow bractlets (Flowers: July).

Fruit: Schizocarp. Wings narrower than the body.



Tailcup Lupine

Lupinus caudatus

Family - Leguminosae

Range: Eastern Oregon, southward to California, east to Montana and Colorado.

Habitat: Typically occurs beneath ponderosa pine in low to mid-elevation warm dry sites.

Look Alikes: May be confused with other lupines, especially spurred lupine (*Lupinus laxiflorus*) - hairs on wing petals; upper calyx lip 1/4 wing petal length or less.

Indicator Value: The lupine of drier sites in the subalpine. Common with grouse huckleberry (ABLA/VASC, ABLA-PIAL/VASC), elk sedge (ARTRV/CAGE9), Idaho fescue (ARTRV/FEID-AGSP), and skunkleaved polemonium (PIAL/RIMO2/POPU3).

Miscellany: Poisonous to sheep and horses, toxic to sheep. Seeds and pods most toxic parts. Pocket gophers use roots extensively. Native Americans used teas from seeds to help urination and as emergency food (following leaching). Belief in birth of a daughter if pregnant woman drank tea from lupine root extract. Nitrogen-fixing.



LUCA

Tailcup Lupine

Lupinus caudatus

LUCA

Habit: Silvery erect perennial forb, 8-16 inches tall; woody caudex.

Stems: Clustered, vasselike.

Leaves: Alternate, deciduous, 7-9 palmately-divided oblanceolate leaflets up to 2 inches long; petiole two times as long as blade on basal leaves; silky hairy on both leaf surfaces.

Flowers: Light blue to violet; racemes up to 12 inches long; calyx spurred; wing petal glabrous; banner hairy on upper surface; calyx lip 1/3-3/4 as long as wing petals (Flowers: May - July).

Fruit: Silky hairy pod about 1 inch long.



Spurred Lupine

Lupinus laxiflorus

Family - Leguminosae

Range: Mainly east of Cascades in Washington, Oregon; east to Idaho, Montana, Utah, and Nevada.

Habitat: Moist, warm to dry, cool mid to high elevation sites occurring with virtually all coniferous tree species in northeastern Oregon.

Look Alikes: May be confused with other lupines, especially tailcup lupine (*Lupinus caudatus*) - glabrous wing petals; upper calyx lip 1/3 wing petal length or greater.

Indicator Value: The lupine of moister sites in the subalpine. Common with green fescue (ARTRV/FEVI, FEVI-LICA2, FEVI-PENST). Type indicator for the green fescue - spurred lupine plant association (FEVI-LULA3).

Miscellany: Taken in quantity, spurred lupine can cause colic in horses, excitability in sheep, and prostration in cattle. Mature fruits are especially toxic to cattle. Nitrogen-fixing.



LULA3

Spurred Lupine

Lupinus laxiflorus

LULA3

Habit: Greenish to grayish erect perennial forb, 8-20 inches tall; woody caudex.

Stem: Clustered, ascending vasselike.

Leaves: Alternate, deciduous, 7-11 palmately-divided oblanceolate leaflets 1-2 inches long; petiole 2-4 times as long as lower basal blades; glabrous or pubescent above.

Flowers: Creamy to bluish, pinkish, violet, rose or purple often on same plant; racemes up to 8 inches long; calyx spurred; wings pubescent on tips; banner hairy on upper surface; calyx lip 1/5-1/4 as long as wing petioles (Flowers: May - July).

Fruits: Silky-hairy pods about 1 inch long.



Cluster Tarweed

Madia glomerata

Family - Asteraceae

Range: British Columbia to Saskatchewan; southward to California, northern Arizona and Colorado.

Habitat: Dry, open sites from foothills, valleys, flats to moderate elevations in the mountains on deep to moderately deep soils.

Look Alikes: The spindle-shaped heads are unique and help differentiate it from other tarweeds. The glomerate heads (clustered densely) are indicative of cluster tarweed - all other tarweeds have more open inflorescences.

Indicator Value: Invader of depleted rangelands that are severely overgrazed. Usually found in dense stands where most competitive herbaceous plants have been eliminated by selective grazing or allelopathic response. Cluster tarweed communities are typified with pygmy lewisia (LEPY2-MAGL2) and western coneflower (RUOC2-MAGL2).

Miscellany: Heavily scented (disagreeable odor of "tar"). Unpalatable to grazing animals. Once established the plant exudes resinous droplets from its glands to effectively sterilize the immediate site from other competitors

(allelopathic). Seeds are eaten by quail, juncos, meadowlarks, goldfinches, sparrows, chipmunks and ground squirrels. Humans can eat the seeds raw, roasted, dried or ground into flour.



Cluster Tarweed

Madia glomerata

MAGL2

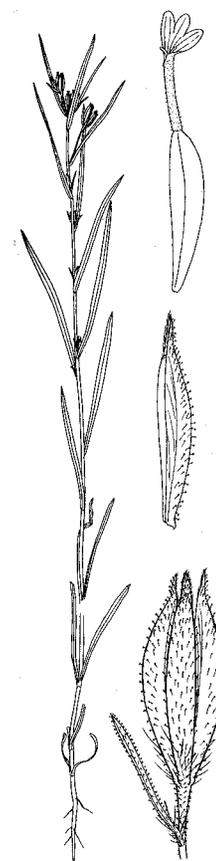
Habit: Slender hairy annual, 4-12 inches tall, erect, hairy, glandular, sticky and foul-smelling.

Stems: Glandular, hairy with ascending branches, or simple.

Leaves: Linear, up to 3 inches long.

Flowers: Spindle-shaped heads in small dense clusters; ray flowers inconspicuous (yellow-purple); disk flowers yellow; involucre bracts exude a tarry resin (Flowers: July - September).

Fruit: Achene (without pappus) - dark brown to black.



Mountain Balm

Monardella odoratissima

Family - Lamiaceae

MOOD

Range: Central Washington to northern Idaho; south to California; east to Colorado and New Mexico.

Habitat: Rocky or gravelly ridges and slopes, talus, and scree - especially on limestone.

Look Alikes: Other mints in the subalpine. *Agastache* (horsemint) - inflorescence an elongated spike; leaves toothed. *Penstemons* with entire leaves - stems round in cross section; flower-corolla tubular, 2-lipped.

Indicator Value: Indicator of mountain balm talus communities.

Miscellany: Strongly aromatic (mint).



Mountain Balm

Monardella odoratissima

MOOD

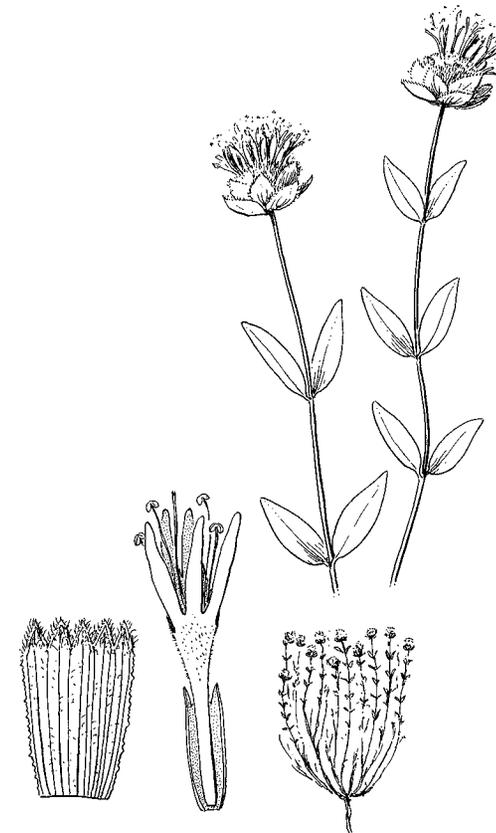
Habit: Numerous stems from a branched caudex; taprooted.

Stem: Woody below; slender, erect to decumbent, 6-20 inches tall; square in cross section.

Leaves: Lanceolate, entire, slightly hairy and glandular, 1/2-1.5 inches long; opposite and sessile on the stem.

Flowers: Dense terminal head, 1/2-1.5 inches wide; conspicuous purplish bracts form distinct involucre below the head; corolla - pink-purple to whitish, up to 3/4 inch long; tube exserted beyond calyx; stamens - 4, slightly exserted (Flowers: July - August).

Fruit: Nutlet.



Sweet Cicely, Sweetroot

Osmorhiza chilensis

Family - Apiaceae

OSCH

Range: Throughout the western and northeastern United States; Chile and Argentina.

Habitat: Wide range from warm, dry to cool, moist sites at mid to upper elevations.

Look Alikes: Other plants with similar leaves are: western sweetroot (*Osmorhiza occidentalis*) - glabrous fruits; pungent licorice smell; western goldthread (*Coptis occidentalis*) - shiny, ovate leaflets; Piper's anemone (*Anemone piperi*) - three biserrate leaflets; nonlicorice taste.

Indicator Value: Common beneath Douglas-fir where mountain big sagebrush occurs and throughout most grand fir and subalpine fir plant associations. Especially common in ABLA/ARCO9, ABLA/VAME, ABLA/VASC and ABLA-PIEN communities.

Miscellany: Palatable to cattle, sheep, deer, and elk (*O. occidentalis* is highly palatable, relished). Roots are edible; gives anise flavoring to food and drink.



Sweet Cicely, Sweetroot

Osmorhiza chilensis

OSCH

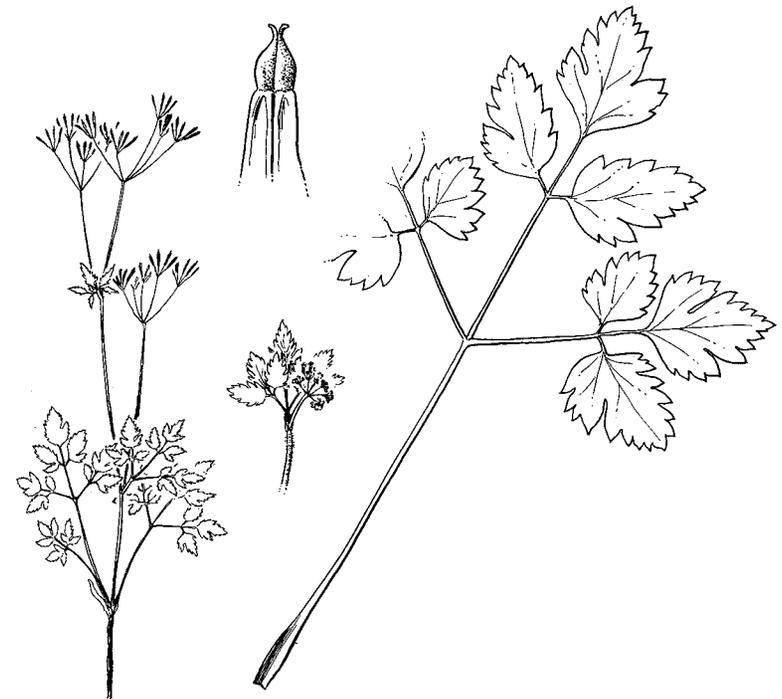
Habit: Deciduous perennial forb, 12-40 inches tall; well-developed taproot.

Stem: Slender, solitary or branched; light hairiness.

Leaves: Basally arranged; thin, biternately compound; ovate, coarsely serrated, incised or lobed leaflets, 1-3 inches long; usually 1-3 cauline leaves on short petioles.

Flowers: Greenish-white, inconspicuous, borne in compound umbels (Flowers: April - June).

Fruit: Green (drying black), hairy schizocarp with beak at apex (clings to clothing).



Western Sweetroot

Osmorhiza occidentalis

Family - Apiaceae

Range: Alberta, British Columbia to Colorado.

Habitat: Thickets and seepy open slopes.

Look Alikes: Other subalpine plants with umbels. *Cymopterus* - yellow flowers; roots not licorice-scented; aromatic odor. *Lomatium* - yellow flowers; roots not licorice-scented; stems short. *Angelica* - white flowers; plants large (24-80 inches tall).

Indicator Value: Commonly found in mountain big sagebrush communities (ARTRV/CAGE2, ARTRV/BRCA5, ARTRV-SYOR2/BRCA5). Has an affinity with mountain snowberry types (SYOR2, PSME/ACGL-SYOR2, ARTRV-SYOR2/BRCA5).

Miscellany: Sheep relish the plant for forage. Roots can be ground for seasoning foods.

OSOC



Western Sweetroot

Osmorhiza occidentalis

OSOC

Habit: Perennial, stout, clustered licorice-scented (anise smelling) roots.

Stem: Stout, clustered, 16-50 inches tall; hairy at nodes.

Leaves: 1-3 times ternate or ternate-pinnate; leaflets lanceolate to ovate, 1-4 inches long, serrated; sometimes incised to trifid; basal leaves: long petiolate and clustered; cauline leaves: short petiolate to sessile.

Flowers: Umbel with 5-12 rays, 1/2-1.5 inches long; no involucre or involucl; yellow (Flowers: April - July).

Fruit: Schizocarp (hairless); rounded at base.



Cusick's Crazyweed

Oxytropis campestris var. *cusickii*

OXCAC3

Family - Fabaceae

Range: British Columbia and Alberta, northeast Oregon to Montana, south to Utah and Colorado.

Habitat: Subalpine and alpine ridges, slopes on sites with little soil and sparse vegetation. Prominent in rocky talus, gravelly slopes, scree, and fellfields.

Look Alikes: *Astragalus* species - leaves on flowering stems. *Oxytropis* species - leaves all basal.

Indicator Value: A strong associate in fellfield, turf, and scree communities.

Miscellany: Named for William C. Cusick (1842-1922) - pioneer botanist in the Wallowa and Blue Mountains. Moderately toxic to horses, sheep, cattle. Usually avoided by animals where other preferred forage is available. "Crazyweed" comes from symptoms of poisoning when livestock stagger due to loss of muscle control.



Cusick's Crazyweed

Oxytropis campestris var. *cusickii*

OXCAC3

Habit: Perennial, caespitose, branched caudex with stout taproot.

Stem: Scapose, 2-12 inches tall, silky hairy, grayish.

Leaves: Basal - odd pinnate, up to 8 inches long; silky hairy leaflets (7-17), oblong - lanceolate, up to 3/8 inch long.

Flowers: Peduncles, 2-5 inches long; raceme spikelike-short, dense, few-flowered (5-15). White to yellowish corollas, up to 1/2 inch long. Calyx - black hairy, 3/8 inch long - half length of corolla. Banner - deeply notched and upright (Flowers: June - July).

Fruit: Pod up to 1 inch long; cylindrical; white to black hairy (Matures: July - September).



Sickletop Lousewort

Pedicularis racemosa

Family - Scrophulariaceae

Range: Widespread in Pacific Northwest.

Habitat: Cool, moist upper elevation sites in spruce and subalpine fir communities.

Look Alikes: Differentiate from other louseworts as follows: white coiled lousewort (*Pedicularis contorta*) - narrow, pinnate leaves; bracted lousewort (*P. bracteosa*) - large, pinnately compound leaves.

Indicator Value: Has high affinity for subalpine fir and Engelmann spruce (ABLA-PIEN communities). Common in ABLA/VAME, ABLA/VASC, and ABLA-PIAL/VASC plant associations.

Miscellany: Our only lousewort with simple leaves. Intermediate host to stalactiform blister rust. Unpalatable. Also called "parrot's beak" based on distinctive upper corolla lip.



PERA

Sickletop Lousewort

Pedicularis racemosa

PERA

Habit: Deciduous, perennial forb, 6-20 inches tall; woody caudex.

Leaves: Simple, alternate; linear to lanceolate, 2-4 inches long; cauline only; doubly serrate margin.

Flowers: White; galea arched and tapers into a down-curved beak - "parrot's beak"; raceme spikelike (Flowers: June - September).

Fruit: Capsule, flattened and arched.



Taper-leaved Penstemon

Penstemon attenuatus

PEAT3

Family - Scrophulariaceae

Range: Northeast Oregon, central Washington to western Montana, southern Idaho, and central Wyoming.

Habitat: Dry meadows, open slopes to alpine ridges.

Look Alikes: Other blue penstemons with entire leaf margins in alpine or subalpine: *P. attenuatus* - glandular inflorescence; 12-25 inches tall; pointed leaf tips. *P. spatulatus* - glandular inflorescence; under 12 inches tall; round leaf tips. *P. procerus* - inflorescence not glandular; pollen sacs open full length; corolla 1/2 inch long or shorter; flowers often point downward. *P. globosus* - inflorescence not glandular; pollen sacs not opening full length; corolla over 1/2 inch long; flowers point outward or upward.

Indicator Value: Common in the subalpine with Idaho fescue (FEID-AGSP-FRALC2, FEID-AGSP-CYTEF, CELE3/FEID-AGSP); elk sedge (CAHO5-CAGE2; CAHO5-BRCA5); and green fescue communities (FRVI-PENST, FEVI-CAHO5). Also occurs in subalpine fir and whitebark pine forests.



544

Miscellany: Our common subalpine varieties are *pseudoprocerus*, and *militaris*.

Taper-leaved Penstemon

Penstemon attenuatus

PEAT3

Habit: Perennial, woody rhizome.

Stem: Erect, slender, solitary to few in a clump, glabrous to fine hairy, 4-25 inches tall.

Leaves: Deep green, lanceolate to oval, entire; basal-petiolate, up to 7 inches long and 1.5 inches wide; cauline - reduced upwards, sessile, opposite.

Flowers: Dense whorled clusters (3-7); glandular-hairy inflorescence; calyx: lanceolate to ovate segments; corolla: blue to purple or white, glandular-hairy, 1/2-3/4 inch long, palate bearded, staminode bearded, yellow; pollen sacs: opposite, opening full length (Flowers: July - August).

Fruit: Capsule.



545

Globe Penstemon

Penstemon globosus

Family - Scrophulariaceae

Range: Northern and west central Idaho; Wallowa and Baker Counties in Oregon. A local endemic.

Habitat: Moist to dry meadows; moist open slopes at middle to high elevations in the mountains.

Look Alikes: Other blue penstemons with entire leaf margins can be differentiated as follows: Wallowa penstemon (*Penstemon spatulatus*) - glandular inflorescence; guidelines inside throat of corolla; taper-leaved penstemon (*P. attenuatus*) - glandular inflorescence; no guidelines; Payette penstemon (*P. payettensis*) - corollas 18-28 mm long; palate not bearded; showy penstemon (*P. speciosus*) - corollas 25-38 mm long; palate not bearded; small flowered penstemon (*P. procerus*) - corollas 6-11 mm long; pollen sacs opening completely; Rydberg's penstemon (*P. rydbergii*) - corollas 11-15 mm long; pollen sacs opening completely.

Indicator Value: An affinity to communities containing Hood's sedge (CAHO5-BRCA5, FEID-CAHO5, FEVI-CAHO5). One of the key penstemons in FEVI-PENST plant community type.

Miscellany: Like most penstemons, increases with disturbance and invades sites which are highly disturbed. Common along constructed trails, around meadow and lake margins where recreational use has caused disturbances.



Globe Penstemon

Penstemon globosus

PEGL5

Habit: Tufted perennial forb from a woody base off a woody rhizome, 8-24 inches tall.

Stems: Glabrous.

Leaves: Opposite, entire; basal leaves petiolate with oblanceolate to elliptic shape, up to 6 inches long. Cauline leaves sessile with lanceolate to ovate shape, up to 5 inches long.

Flowers: Inflorescence of one to several dense "globose" clusters (not glandular); corolla bright blue to blue-purple, 15-20 mm long; palate bearded; staminode densely bearded; pollen sacs partially opening and spread (Flowers: June - August).

Fruit: Capsule.



Small-flowered Penstemon

Penstemon procerus

Family - Scrophulariaceae

Range: Alaska, Yukon to California, Colorado.

Habitat: Meadows, open slopes to scree, fellfields.

Look Alikes: Other blue penstemons with entire leaf margins in alpine or subalpine: *P. attenuatus* - glandular inflorescence; 12-25 inches tall; pointed leaf tips. *P. spatulatus* - glandular inflorescence; under 12 inches tall; round leaf tips. *P. procerus* - inflorescence not glandular; pollen sacs open full length; corolla 1/2 inch long or shorter; flowers often point downward. *P. globosus* - inflorescence not glandular; pollen sacs not opening full length; corolla over 1/2 inch long; flowers point outward or upward.

Indicator Value: The most common penstemon in the green fescue - penstemon (FEVI-PENST) plant association. Also common in shrubby potentilla (POFR), fellfield, turf and scree communities.

Miscellany: The most wide ranging of all Pacific Northwest penstemons. Our common varieties are *procerus*, *formosus*, and *brachyanthus*. The specific name "*procerus*" is Latin for "tall" - which this penstemon is not - especially in alpine settings. The flowers are smaller than those of other penstemons in the subalpine and alpine.



Small-flowered Penstemon

Penstemon procerus

PEPR2

Habit: Tufted perennial with a woody rhizome.

Stem: Erect to decumbent, slender, glabrous, up to 8 inches tall.

Leaves: Basal - petiolate; lanceolate, glabrous, entire, up to 3 inches long. Cauline - sessile, lanceolate, entire, reduced upwards, opposite.

Flowers: Dense clusters (2-3), with declined flowers; calyx: up to 1/4 inch long, segments acute to acuminate; corolla: deep blue-purple, up to 1/2 inch long, glabrous, palate bearded; staminode: bearded, yellowish hairs. Pollen sacs: opposite, opening full length (Flowers: July - August).

Fruit: Capsule.



Wallowa Penstemon

Penstemon spatulatus

Family - Scrophulariaceae

PESP2

Range: Wallowa Mountains endemic.

Habitat: Subalpine open slopes to alpine fellfields and turf communities.

Look Alikes: Other blue penstemons with entire leaf margins in alpine or subalpine: *P. attenuatus* - glandular inflorescence; 12-25 inches tall; pointed leaf tips. *P. spatulatus* - glandular inflorescence; under 12 inches tall; round leaf tips. *P. procerus* - inflorescence not glandular; pollen sacs open full length; corolla 1/2 inch long or shorter; flowers often point downward. *P. globosus* - inflorescence not glandular; pollen sacs not opening full length; corolla over 1/2 inch long; flowers point outward or upward.

Indicator Value: Defines the Idaho fescue-Wallowa penstemon (FEID-PESP2) plant community type. Also an occupant of fellfield and turf communities.



Wallowa Penstemon

Penstemon spatulatus

PESP2

Habit: Perennial from a woody caudex, mat-forming.

Stem: Clustered, glabrous, 4-10 inches tall, decumbent, mat-forming.

Leaves: Basal - entire, petiolate; up to 2.25 inches long, elliptic. Cauline - few, sessile, up to 1.25 inch long, lanceolate.

Flowers: Glandular-hairy, 1-4 crowded, dense clusters; calyx: 1/4 inch long, glandular; corolla: blue-violet, glandular hairy, 1/2 inch long, palate bearded; staminode: bearded, yellow hairs; pollen sacs: opposite, opening full length (Flowers: July - August).

Fruit: Capsule.



Silverleaf Phacelia

Phacelia hastata

PHHA

Family - Hydrophyllaceae

Range: Southern British Columbia and Alberta south to California; east to Colorado and Nebraska.

Habitat: Dry, open slopes, talus and scree slopes

Look Alikes: Very similar to varileaf phacelia (*P. heterophylla*) which is taller - usually over 20 inches tall, single stemmed, with many leaves containing basal lobes. Phacelia species can be distinguished by the coiled cymes of the inflorescence, exserted stamen filaments, and the hastate leaves.

Indicator Value: Commonly found in big sagebrush/Idaho fescue (ARTRV/FEID), mountain-mahogany/Idaho fescue (CELE3/FEID-AGSP), Idaho fescue - bluebunch wheatgrass - Cusick's fraseria (FEID-AGSP/FRALC2), linanthastrum-cymopterus (LINU4-CYTEF), scree, and rocky outcrop communities. Occurs in whitebark pine (PIAL/RIMO2/POPU3) and subalpine fir forests.

Miscellany: The species name "*hastata*" refers to occasional leaves with lateral lobes at the leaf base. Our subalpine/alpine varieties are "*leptosepala*" and "*alpina*." Deer and elk readily eat the coiled inflorescences.



Silverleaf Phacelia

Phacelia hastata

PHHA

Habit: Perennial, taprooted from a branched caudex.

Stem: Several, erect to decumbent, up to 20 inches tall; herbage silverish or greenish-gray; short silvery hairs.

Leaves: Basal - tufted, alternate, entire, elliptic to lanceolate, petiolate, up to 4 inches long, prominent veins, silvery hairy. Cauline - petiolate to sessile, entire, reduced upwards.

Flowers: Dense, compact coiled cymes. Corolla white to lavender, about 1/4 inch long, funnel-shaped with 5 lobes. Filaments exserted conspicuously twice the length of the corolla (Flowers: June - July).

Fruit: Capsule with 2 chambers.



Varileaf Phacelia

Phacelia heterophylla

Family - Hydrophyllaceae

Range: Washington to Montana; southward to central California, Arizona and New Mexico. Common in western United States.

Habitat: Dry, open, rocky slopes at lower mountainous elevations.

Look Alikes: Differentiate from other phacelias as follows: silky phacelia (*Phacelia sericea*) - leaves dissected into many, small segments; threadleaf phacelia (*P. linearis*) - leaves all on the stem (not basal); silverleaf phacelia (*P. hastata*) - leaves all entire; usually under 2 feet tall; often prostrate.

Indicator Value: Common on shifting, deep soil slopes and dry exposures from whitebark pine, subalpine fir forest to mountain big sagebrush, Idaho fescue, and Hood's sedge rangelands in the subalpine.

Miscellany: Plants used by ground squirrels, deer and elk.

PHHE2



Varileaf Phacelia

Phacelia heterophylla

PHHE2

Habit: Biennial or short-lived perennial forb with a slender taproot.

Stems: Erect, stout stems, up to 4 feet tall, usually 2-3 feet tall; grayish-green with short hairs.

Leaves: Lower leaves with petioles; 1-2 pairs of lobes or leaflets at base of blade; terminal segment much larger; cauline leaves reduced upward and short petiolate; all leaves prominently veined.

Flowers: Cymes densely bristled, curled; flowers dull whitish to purplish; filaments conspicuously exerted (Flowers: May - July).

Fruit: Capsule.



Mountain Phlox

Phlox austromontana

PHAU3

Family - Polemoniaceae

Range: Northeast and central Oregon, Seven Devils of Idaho, Great Basin, Sierra Nevada of southern California, Colorado Plateau of Utah, Nevada, and northern Arizona.

Habitat: Dry to moderately moist, open slopes (often stony or rocky).

Look Alikes: Other subalpine and alpine phlox species. *P. caespitosa* - intercostal membrane flat; up to 6 inches tall, erect. *P. pulvinata* - intercostal membrane flat; compact, mat-forming; style 2-5 mm. long (no woolly hairs). *P. diffusa* - intercostal membrane flat; compact; mat-forming; style over 5 mm. long. *P. hoodii* - intercostal membrane flat; forms dense cushion cushions; style 2-5 mm. long; calyx woolly. *P. austromontana* - intercostal membrane keeled; up to 10 inches tall - erect.

Indicator Value: Defines the elk sedge - mountain phlox (CAGE2-PHAU3) community. Also prominent in mountain big sagebrush/elk sedge (ARTRV/CAGE2) plant association, phlox-cymopterus (PHLOX-CYTEF), and alpine fleecflower cornice communities. Also found in whitebark pine (PIAL/CAGE2, PIAL/RIMO2/POPU3) and subalpine fir-whitebark pine forests.

Miscellany: This species was only encountered in the Elkhorn, Greenhorn, and Strawberry Mountains of the Blue Mountains in this study.



Mountain Phlox

Phlox austromontana

PHAU3

Habit: Perennial, caespitose, taprooted, forming dense mats.

Stem: Up to 10 inches tall, erect, glabrous to hairy but not glandular; pale grayish green.

Leaves: Stiff, sharp, linear, up to 3/4 inch long.

Flowers: Solitary; calyx - hairy, sharp pointed; intercostal membrane with a low keel; corolla: white to pinkish, waning purplish, up to 5/8 inch long (Flowers: June - July).

Fruit: Capsule.



Hood's Phlox

Phlox hoodii

PHHO

Family - Polemoniaceae

Range: Alaska and the Yukon to Alberta and Saskatchewan to central Washington, Idaho, eastern Oregon; northeast California, Nevada, Utah, Wyoming, Colorado, and Nebraska.

Habitat: Dry, open rocky sites on exposed ridges and slopes.

Look Alikes: Other subalpine and alpine phlox species. *P. caespitosa* - intercostal membrane flat; up to 6 inches tall, erect. *P. pulvinata* - intercostal membrane flat; compact, mat-forming; style 2-5 mm. long (no woolly hairs). *P. diffusa* - intercostal membrane flat; compact; mat-forming; style over 5 mm. long. *P. hoodii* - intercostal membrane flat; forms dense cushions; style 2-5 mm. long; calyx woolly. *P. austromontana* - intercostal membrane keeled; up to 10 inches tall - erect.

Indicator Value: Occurs in green fescue-Parry's rush (FEVI-JUPA) plant association; fellfields, turf and scree communities of the alpine.

Miscellany: Increases with drought and heavy grazing by ungulates. Topkilled by fire; readily root sprouts the following year after a burn.



Hood's Phlox

Phlox hoodii

PHHO

Habit: Low caespitose, cushion or mat-forming perennial, taprooted.

Stem: Caespitose, woolly to glabrous, perhaps glandular, under 4 inches tall.

Leaves: Firm, awl-shaped, linear, up to 3/8 inch long, long hairy margins.

Flowers: Solitary, sessile; calyx: woolly, intercostal membranes flat; lobes narrow and firm; corolla: a 5-lobed tube (tube less than twice as long as calyx); white, bluish to pink, up to 3/8 inch long; style up to 5 mm. long (Flowers: May - June).

Fruit: Capsule.



Cushion Phlox

Phlox pulvinata

Family - Polemoniaceae

PHPU5

Range: Southwest Montana, south to New Mexico and west to northeast Oregon, Nevada and Utah.

Habitat: Open, exposed ridgetops and rocky slopes.

Look Alikes: Other subalpine and alpine phlox species. *P. caespitosa* - intercostal membrane flat; up to 6 inches tall, erect. *P. pulvinata* - intercostal membrane flat; compact, mat-forming; style 2-5 mm. long (no woolly hairs). *P. diffusa* - intercostal membrane flat; compact; mat-forming; style over 5 mm. long. *P. hoodii* - intercostal membrane flat; forms dense cushions; style 2-5 mm. long; calyx woolly. *P. austromontana* - intercostal membrane keeled; up to 10 inches tall - erect.

Indicator Value: Frequently found on dry, cold sites in the subalpine and alpine of the Blue Mountains. Common under mountain big sagebrush/elk sedge (ARTRV/CAGE2) and in rough fescue (FESC-FEID), Parry's rush (JUPA-AGGL) plant communities. Principal phlox in communities with ivesia (PHLOX-IVGO) and cymopterus (PHLOX-CYTEF). A component of some fellfields, turf and scree communities.



Cushion Phlox

Phlox pulvinata

PHPU5

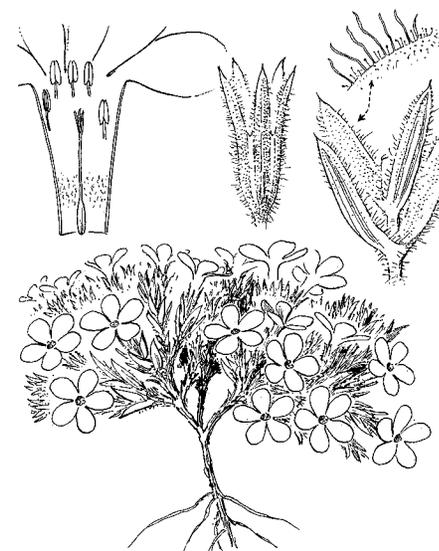
Habit: Perennial, taproot.

Stem: Cespitose, erect to spreading, under 2.5 inches tall, mat-forming.

Leaves: Linear, sessile, glabrous to hairy or glandular, up to 1/2 inch long.

Flowers: Solitary, terminal; calyx: glabrous to sparsely hairy, lanceolate lobes, intercostal membrane flat; corolla: white to bluish, tube twice as long as calyx (Flowers: June- August).

Fruit: Capsule.



Skunk-leaved Polemonium

Polemonium pulcherrimum

POPU3

Family - Polemoniaceae

Range: Throughout the mountainous western United States.

Habitat: Moist, cool often shaded areas at high elevations.

Look Alikes: Other polemoniums can be differentiated as follows: sticky polemonium (*Polemonium viscosum*) and elegant polemonium (*P. elegans*) - corolla tube longer than calyx; western polemonium (*P. occidentale*) - tall (1-3 feet), single stem.

Indicator Value: Indicates cold environments in subalpine fir and whitebark pine plant associations. An affinity with heartleaf arnica (ARCO9). Type indicator for PIAL/RIMO2/POPU3, ABLA-PIAL/POPU3, and ABLA/POPU3 plant associations. Common in ABLA-PIEN/ARCO9, ABLA-PIAL/VASC/ARCO9, and ABLA/ARCO9 plant associations. Also prevalent in ABLA/VASC, ABLA/VAME, ABLA-PIAL/CAGE2, ABLA-PIEN/LEGL, and ABLA-PIEN/MEFE plant associations.

Miscellany: Unpalatable to cattle; slightly palatable to sheep. Also known as "Jacob's ladder" from leaflet orientation. Emits a "skunky" odor on crushing of foliage - thus its common name.



Skunk-leaved Polemonium

Polemonium pulcherrimum

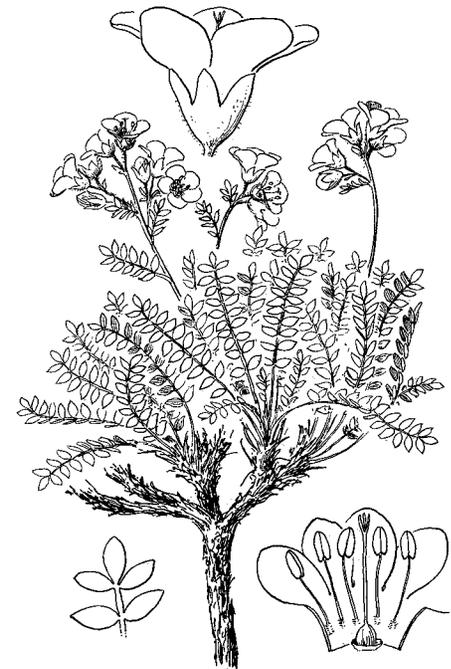
POPU3

Habit: Deciduous, erect, perennial forb, 12-20 inches tall; clustered stems from branched woody caudex.

Leaves: Alternate, deciduous, pinnately compound, 11-15 leaflets; oval to orbicular; emits "skunky" odor on crushing.

Flowers: Blue with light yellow to white throat, showy, bell-shaped, borne in cymes (Flowers: May - August).

Fruits: Capsule.



Alpine Fleeceflower

Polygonum phytolaccaefolium

POPH

Family - Polygonaceae

Range: Alaska to California east to Idaho, western Montana, eastern Oregon and western Nevada.

Habitat: Subalpine to alpine dry meadows, talus slopes, rock slides, open slopes and ridges.

Look Alikes: Very distinctive at high elevations with its succulent, glabrous, tall stature.

Indicator Value: Disturbance indicator. Found beneath whitebark pine, subalpine fir, and in disturbed fescue grasslands at high elevations. A good soil binder. Type indicator of alpine fleeceflower cornice and disturbance communities (POPH-AGUR-LINU4, POPH-CAGE2-LINU4). Also abundant in disturbed sites of subalpine fir (ABLA-PIAL/ARAC2), mountain big sagebrush (ARTRV/CAGE2), and green fescue (FEVI-STOC2, FEVI-LULA3).

Miscellany: Invades depleted high elevation grasslands and quickly colonizes after highly erosive events (landslides, avalanches). Usually avoided by livestock. Elk graze the flowering tops. After the first autumn

frosts the plants turn orange-yellow, red to rusty-brown. Nez Perce roasted or boiled the roots; ground the seeds into flour.



564

Alpine Fleeceflower

Polygonum phytolaccaefolium

POPH

Habit: Perennial herb from a large branched crown and thick root, 2-6 feet tall.

Stems: Glabrous, erect, several stemmed and branched with a grooved stem.

Leaves: Shiny, lanceolate with entire, wavy margins; alternate, slightly reduced upwards, 2.5-5 inches long; all leaves cauline.

Flowers: Panicles (terminal, axillary); flowers white to greenish-white; stamens - 8; styles - 3 (Flowers: June - August).

Fruit: 3-sided achene (yellowish-brown); smooth.



565

Sticky Cinquefoil

Potentilla glandulosa

Family - Rosaceae

Range: British Columbia to Baja California; east to Alberta and south to Montana, Wyoming, Colorado, Utah and Arizona.

Habitat: Subalpine slopes, meadows to fellfields, talus, and scree in alpine environments.

Look Alikes: Other cinquefoils in subalpine and alpine settings. Shortleaf cinquefoil (*P. brevifolia*) - stems up to 4 inches tall; plant yellow-green; blueleaf cinquefoil (*P. diversifolia*) - leaves palmate; leaves hairy on both sides; fanleaf cinquefoil (*P. flabellifolia*) - leaves with 3 leaflets; shrubby cinquefoil (*P. fruticosa*) - shrub; slender cinquefoil (*P. gracilis*) - leaves palmate, leaves hairy beneath, green above; sticky cinquefoil (*P. glandulosa*) - leaves pinnate; stems over 6 inches tall.

Indicator Value: Common with mountain big sagebrush (ARTRV/CAGE2) and with mountain snowberry (ARTRV-SYOR2/BRCA5; SYOR2). Hood's sedge communities (CAHO5-BRCA5, CAHO5-POGL9), quaking aspen (POTR5/CAGE2), and alpine fleecflower (POPH-CARU-CAGE2) communities often contain sticky cinquefoil. Also found in subalpine fir and whitebark pine forests. Idaho fescue and green fescue (FEVI-JUPA, FEVI-LULA3) plant communities.

Miscellany: *Potentilla* derives from "*potens*" in Latin referring to "potent or powerful" for its effectiveness in stopping bleeding and dysentery. Little used by ungulates.



Sticky Cinquefoil

Potentilla glandulosa

POGL9

Habit: Perennial, erect, branched caudex with well developed roots.

Stem: Many-stemmed, glandular, 6-12 inches tall.

Leaves: Basal - pinnate, leaflets 5-9; obovate, about 1 inch long, serrated, glandular, hairy; cauline - reduced upward, few in number.

Flowers: Cyme with few flowers on erect, wide spreading branches with leafy bracts; calyx: cup shaped, 5 sepals; petals: buttery yellow to light yellow, obovate, 5 in number, longer than sepals; numerous stamens and pistils (Flowers: June - July).

Fruit: Achene.



Sidebells Pyrola

Pyrola secunda

Family - Ericaceae

Range: Widespread in North America.

Habitat: Cool, moist dark sites beneath dense tree canopies at mid to upper elevations.

Look Alikes: Sidebells pyrola has a leafy aerial stem, light green leaves, and flowers on one side of raceme which differentiates it from other wintergreens.

Indicator Value: Defines sites capable of supporting the true fir and mountain hemlock plant associations. Close affinity with huckleberries (TSME/VASC, TSME/VAME, ABLA/VASC, ABLA/VAME, ABGR/VAME). Also a common plant in ABLA-PIEN plant associations (especially ABLA-PIEN/MEFE, ABLA-PIEN/CLUN2, ABLA-PIEN/ARCO5).

Miscellany: Unpalatable.



Sidebells Pyrola

Pyrola secunda

PYSE

Habit: Low, evergreen, perennial forb, 2-6 inches tall, rhizomatous.

Leaves: Alternate, thin, shiny light green above and pale below; ovate to ovate-elliptic, 1.5-2.5 inches long on short petioles.

Flowers: White, straight style, borne on one-sided 6-20 flowered raceme (Flowers: June - August).

Fruit: Dry, globose capsule.



Lanceleaved Stonecrop

Sedum lanceolatum

Family - Crassulaceae

SELA

Range: Alaska, Yukon, south to California, east to Alberta, South Dakota, Nebraska, Colorado and New Mexico.

Habitat: Gravelly or rocky soils, dry slopes and ridgetops, rock outcrops.

Look Alikes: Wormleaf stonecrop (*S. stenopetalum*) - leaves keeled; bulbils in axils of upper cauline leaves; follicles spread outward at maturity.

Indicator Value: Defines the Sandberg's bluegrass - lanceleaved stonecrop (POSA12-SELA) plant community. Commonly found in mountain-mahogany/Idaho fescue-bluebunch wheatgrass (CELE3/FEID-AGSP) and low sagebrush/Idaho fescue-bluebunch wheatgrass (ARAR8/FEID-AGSP) plant associations. In alpine settings it occurs in fellfield, turf, and scree communities. Also a component in Idaho fescue, mountain big sagebrush, and whitebark pine plant communities.

Miscellany: Persists in dry habitats with its succulent leaves and stems. Easy to propagate in rock gardens on well drained soils and in sunny southerly locations.



Lanceleaved Stonecrop

Sedum lanceolatum

SELA

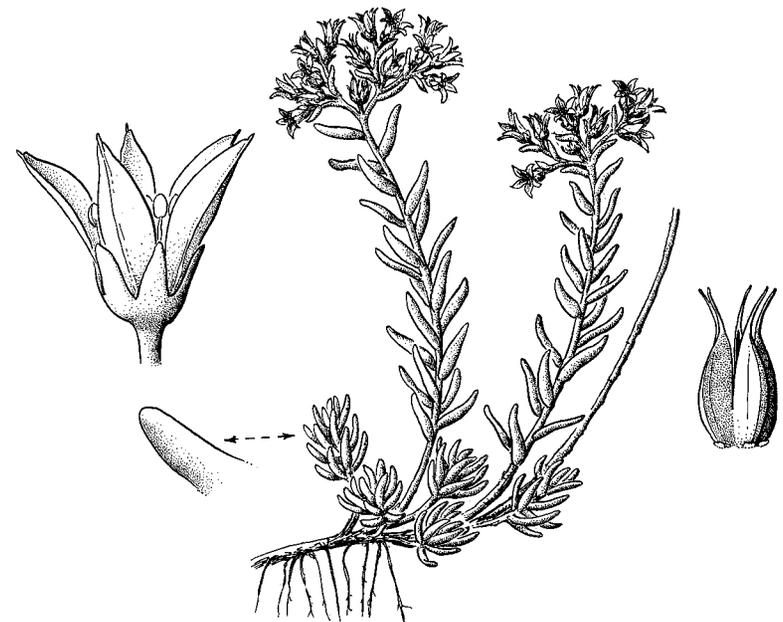
Habit: Perennial with slender branching rhizomes, sterile shoots, forming basal rosettes.

Stem: Erect, decumbent at the base, up to 8 inches tall.

Leaves: Basal - rosettes of thick, fleshy leaves. Cauline - alternate, linear, terete, sessile, succulent, up to 3/4 inch long.

Flowers: Cyme: crowded; calyx: lanceolate, lobes with acute to acuminate tips; petals: yellow (reddish tinged), lanceolate with acuminate tips, longer than stamens, 5 in number; stamens - 10; pistils - 5 (Flowers: July - August).

Fruit: Follicles (5), erect at maturity with divergent beaks.



Woolly Groundsel

Senecio canus

Family - Asteraceae

Range: British Columbia to Saskatchewan, south to California and east to Colorado and Nebraska.

Habitat: Dry, open, rocky slopes, forest openings to fellfields in the alpine.

Look Alikes: Other groundsel in subalpine and alpine environments. *S. fremontii* - dwarf; under 4 inches tall. *S. triangularis* - erect; over 8 inches tall, leaves triangular. *S. streptanthifolius* - cauline leaves lobed over halfway to midrib. *S. canus* - leaves hairy to woolly; bracts of involucre dark - not black. *S. crassulus* - glabrous at flowering time; bracts of involucre black tipped.

Indicator Value: Occurs in mountain big sagebrush/elk sedge (ARTRV/ CAGE2), Rocky Mountain juniper/mountain-mahogany (JUSC2/ CELE3), Douglas-fir/pinemat manzanita/elk sedge (PSME/ARNE/CAGE2), fellfield, and outcrop communities. Also found in subalpine fir, subalpine fir - whitebark pine, and Idaho fescue plant communities.

Miscellany: The species "*canus*" refers to gray or ash-colored hairs. The common name "groundsel" means "to swallow the ground" in Anglo-Saxon for the rapid colonization or spread by the plants. Provides forage for domestic and bighorn sheep.



572

Woolly Groundsel

Senecio canus

SECA2

Habit: Perennial, branched caudex and short taproot.

Stem: Several, tufted, white - hairy to gray-woolly, up to 16 inches tall; about 8 inches tall in alpine environments.

Leaves: Basal - petiolate, clustered, ovate to oblanceolate, entire to toothed, about 1.5 inch long; white-woolly. Cauline - reduced upwards, sessile, lanceolate, entire.

Flowers: Heads in a corymb; woolly involucre 3/8 inch high; bracts in one series - lanceolate with blackish tip; ray flowers: yellow, about 1/2 inch long; disk flowers: yellow, about 1/2 inch wide (Flowers: June - August).

Fruit: Achene; pappus of white capillary bristles.



573

Thick-leaved Groundsel

Senecio crassulus

Family - Asteraceae

SECR

Range: Northeast Oregon to southwest Montana, Idaho, Utah, and New Mexico.

Habitat: Dry openings in the forest; meadows, streambanks.

Look Alikes: Other groundsels in subalpine and alpine environments. *S. fremontii* - dwarf; under 4 inches tall. *S. triangularis* - erect; over 8 inches tall, leaves triangular. *S. streptanthifolius* - cauline leaves lobed over halfway to midrib. *S. canus* - leaves hairy to woolly; bracts of involucre dark - not black. *S. crassulus* - glabrous at flowering time; bracts of involucre black tipped.

Indicator Value: Common in whitebark pine plant associations (PIAL/RIMO2/POPU3, PIAL/VASC/LUHI4, PIAL/CAGE2) and subalpine fir - whitebark pine communities (ABLA-PIAL/VASC/CARO5, ABLA-PIAL/CAGE2).

Miscellany: Provides good forage for sheep (domestic or bighorn).



Thick-leaved Groundsel

Senecio crassulus

SECR

Habit: Perennial, glabrous, simple to branched caudex, fibrous roots.

Stem: Several, tufted, erect, up to 20 inches tall.

Leaves: Basal - petiolate, thickish, entire to dentate, elliptic to oblanceolate, up to 4.75 inches long and 2 inches wide. Cauline - sessile, clasping, reduced upwards (lower stem leaves larger than basal leaves).

Flowers: Corymb. Heads-several; involucre 3/8 inch high with approximately 13 bracts having dark tips; ray flowers: yellow, usually 8-13 in number; about 1/2 inch long; disk flowers: yellow (Flower: June - August).

Fruit: Achene with white pappus.



Western Groundsel

Senecio integerrimus

Family - Asteraceae

Range: Southern British Columbia to California eastward to Saskatchewan and Minnesota.

Habitat: Dry to moist foothills, valleys, ridges; at all mountainous elevations (especially prominent with ponderosa pine, juniper and big sagebrush).

Look Alikes: May be confused with arnicas (*Arnica* spp.) - lower leaves are opposite. Differentiate from other groundsel (*Senecio* spp.) as follows: arrowleaf groundsel (*S. triangularis*) - leaves triangular; tall groundsel (*S. serra*) - stem leaves as long as the lower leaves; mountain marsh butterweed (*S. sphaerocephalus*) - leaves entire, thin; black involucre bract tips; woolly groundsel (*S. canus*) - multiple stems; woolly gray stems and leaves.

Indicator Value: Increaser; especially on summer rangelands overgrazed by cattle. Common in mountain big sagebrush plant associations (ARTRV/FEID-AGSP, ARTRV/CAGE2) and in subalpine Idaho fescue plant community types (FEID-CAHO5, FEID-GETR).

Miscellany: Fair early season forage for elk and cattle before it loses succulence. Sheep relish the plant. Known to concentrate alkaloids and to be poisonous to livestock. Normally not eaten in sufficient amount to cause poisoning problems except on depleted rangelands where other forage is less available.



Western Groundsel

Senecio integerrimus

SEIN2

Habit: Stout perennial forb, fibrous roots from a very short, erect crown.

Stems: Solitary, 8-28 inches tall; cobwebby to white woolly hairy when young, becoming glabrous as summer season progresses.

Leaves: Alternate, lance-shaped, petiolate at base, entire to irregularly toothed; blade and petiole 2.5-10 inches long; cauline leaves progressively smaller on the stem - becoming sessile.

Flowers: Heads about 1/2 inch in diameter; several in a congested flat-topped cluster; terminal head normally stalkless; rays and disk flowers yellow to yellow-orange; involucre bracts in one row with black tips (Flowers: May - July).

Fruit: Round achene.



Arrowleaf Groundsel

Senecio triangularis

Family - Asteraceae

SETR

Range: Widespread in mountains of the western United States.

Habitat: Cool, wet and cool, moist soils at upper elevations under spruce, subalpine fir, and as a riparian species.

Look Alikes: Easily recognized.

Indicator Value: Occurs beneath Engelmann spruce and subalpine fir often associated with meadowrue and tall bluebells. Common in ABLA-PIEN plant associations (ABLA-PIEN/ARCO9, ABLA-PIEN/CLUN2). Type indicator for the ABLA-PIEN/SETR community.

Miscellany: Palatable to deer and elk; highly palatable to sheep.



Arrowleaf Groundsel

Senecio triangularis

SETR

Habit: Tall, deciduous perennial forb, 1-5 feet tall; clustered stems.

Leaves: Numerous, alternate, triangular-shaped, 2-8 inches long; lower leaves large with long petioles; reduction in size upwards as leaves become sessile.

Flowers: Yellow; numerous heads in flat-topped inflorescence (Flowers: June - September).

Fruit: Achene.



Sibbaldea

Sibbaldea procumbens

Family - Rosaceae

Range: Circumpolar species. Throughout the Pacific Northwest to California and Rocky Mountains to Utah and Colorado.

Habitat: Moist meadows, moist alpine slopes and moist coniferous forests; usually near streams, meadows and lake shores.

Look Alikes: Distinctive with its 3 wedge-shaped leaves toothed at the end. May be confused with strawberries (*Fragaria* spp.) but leaves are serrated on the sides and flowers are white.

Indicator Value: Increases with disturbance on subalpine lake shores, beneath spruce and subalpine fir at campsites, and along trails.

Miscellany: Its aggressive mat-forming habit makes it a good candidate for rehabilitation of trampled, compacted subalpine sites.



Sibbaldea

Sibbaldea procumbens

SIPR

Habit: Perennial forb, mat-forming from strong rhizomes.

Leaves: Petioled; arising from horizontal stems; 3 leaflets - wedge-shaped to obovate, 1/2-3/4 inch long with 3-5 teeth at apex; large, brown stipules.

Flowers: Flowering stems 2-3 inches tall with 2-15 flowers in a cyme; petals yellow-about half as long as sepals; 5 stamens alternate with the petals (Flowers: June - August).

Fruit: Achene (stipitate).



Alpine Goldenrod

Solidago multiradiata var. *scopulorum*

SOMUS2

Family - Asteraceae

Range: Alaska south to California; Utah, New Mexico, and east to Quebec.

Habitat: Meadows, lake margins, rocky slopes to fellfields.

Look Alikes: All goldenrods have 3 prominent parallel veins on leaves. To differentiate from leaves of penstemons look for one main vein. The only other goldenrod in the subalpine is *S. missouriensis* (Missouri goldenrod). It does not have ciliate (hairy) petioles.

Indicator Value: Common in the Idaho fescue - Wallowa penstemon (FEID-PESP2) plant community type and in fellfield, scree and turf communities. Also found in whitebark pine (PIAL/RIMO2/POPU3) and subalpine fir - whitebark pine forests.

Miscellany: Tea from leaves used to relieve gastric intestinal distress. "Solidago" is Latin for "to make whole" referring to its curative power.



Alpine Goldenrod

Solidago multiradiata var. *scopulorum*

SOMUS2

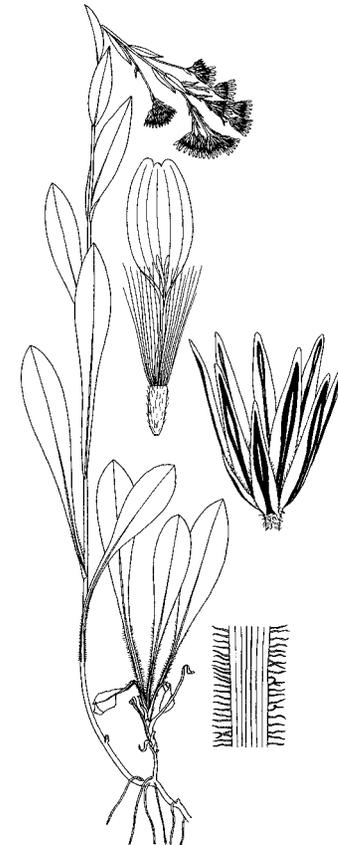
Habit: Perennial, tufted, short rhizome off branched caudex.

Stem: Few to several, up to 20 inches tall, hairy above, decumbent and purplish at base.

Leaves: Basal - petiolate (ciliate margins); oblanceolate to elliptic, up to 4 inches long; glabrous; entire to serrated; 3-nerved. Cauline - reduced upward; sessile, lanceolate; entire.

Flowers: Raceme or corymb. Heads few, pedicels hairy white. Involucre - 1/4 inch high, bracts with prominent midvein, acute; ray flowers: usually 13 in number, 1/4 inch long, yellow; disc flowers: yellow, about 21 in number (Flowers: July - August).

Fruit: Achene, pappus of white bristles.



Pussypaws

Spraguea umbellata

Family - Portulacaceae

SPUM

Range: British Columbia south on east side of Cascades to Baja California; east to Montana, Wyoming and Utah.

Habitat: Dry, sandy ridges, saddles, and slopes on talus and scree. Notable on gravelly cornices following recession of snowbanks.

Look Alikes: Buckwheats (*Eriogonum*) at subalpine and alpine elevations with rounded inflorescences. *E. ovalifolium* - leaves white hairy, scapes hairy, inflorescence subtended by 3 bracts. *E. umbellatum* - plants under 4 inches tall, inflorescence umbellate - rays visible (not capitate).

Indicator Value: Occupies erosional surfaces in green fescue (FEVI, FEVI-LULA3, FEVI-PENST, and FEVI-STOC2) plant communities. Common in the gravels of whitebark pine/prickly sandwort (PIAL/ARAC4) plant community type.

Miscellany: The species name "*umbellata*" is Latin for "umbrella" and refers to the capitate inflorescence at the end of a naked stem (peduncle).



Pussypaws

Spraguea umbellata

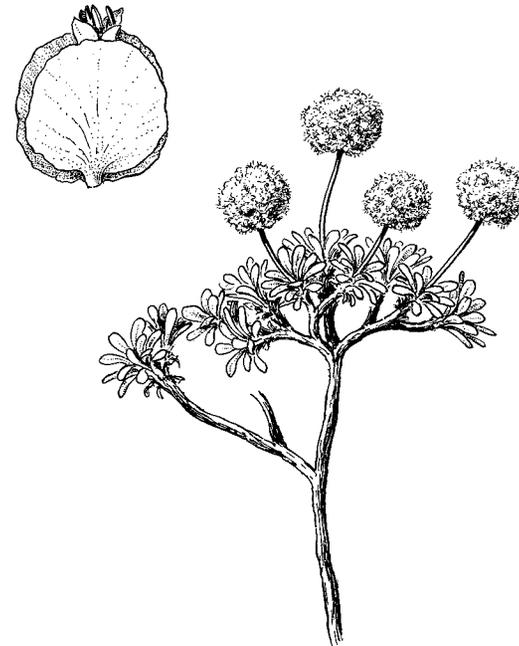
SPUM

Habit: Dwarf perennial, branched, thickened caudex, spindle-shaped taproot, mat-forming.

Leaves: Basally clustered rosette, petiolate, spatulate, glabrous, 1/2-1 inch long.

Flowers: Capitate terminal heads up to 1.5 inches broad on leafless peduncles up to 3 inches tall; sepals - 2, white to pinkish margined, tips rounded; petals - 4, pink to white, obovate, equal to or shorter than the sepals; stamens - 3, exerted (Flowers: June - August).

Fruit: Capsule-round with shiny black seeds.



Western Meadowrue

Thalictrum occidentale

Family - Ranunculaceae

THOC

Range: Throughout the Pacific Northwest and Rocky Mountains.

Habitat: Wide range of habitats from warm, moist and warm, dry at mid elevations to cool, dry and cool, moist at upper elevations.

Look Alikes: Leaves of western meadowrue can be confused with the following: columbines (*Aquilegia* spp.) - leaves less dissected; leaflets larger; prominent veins; Fendler's meadowrue (*Thalictrum fendleri*) - achenes erect; stigma not purplish.

Indicator Value: Defines the cool, moist end of true fir series plant associations. Increaser with disturbance. Most prominent in mid seral stages. Strong affinity to Engelmann spruce and subalpine fir forests (ABLA-PIEN/ARCO9, ABLA-PIEN/CLUN2, ABLA-PIEN/LIBO3, ABLA-PIEN/MEFE, ABLA/ARCO9, ABLA/VAME).

Miscellany: Unpalatable. Plants are dioecious.



Western Meadowrue

Thalictrum occidentale

THOC

Habit: Mid sized, 1-3 feet, deciduous, dioecious perennial forb.

Stems: Glabrous, slender.

Leaves: Alternate, 3-4 times ternate; leaflets rounded, three lobed and 2-3 times toothed or lobed; horizontal orientation; green above, pale below.

Flowers: Inconspicuous, greenish-white, borne in a panicle; stigma purplish (Flowers: May - July).

Fruits: Spindle-shaped achene, three prominent veins on side.



Coolwort Foamflower

Tiarella trifoliata var. *unifoliata*

TITRU2

Family - Saxifragaceae

Range: Widespread in Pacific Northwest.

Habitat: Cool, moist streamsides and bottom locations (often under spruce).

Look Alikes: Mitreworts (*Mitella* spp.) - capsules are saucer-shaped; goldthread (*Coptis occidentalis*) - shiny leaves.

Indicator Value: Indicative of spruce-dominated bottoms and late seral ABLA2/CLUN plant communities.

Miscellany: Unpalatable. Common name "foamflower" derived from the gross appearance of the inflorescence.



Coolwort Foamflower

Tiarella trifoliata var. *unifoliata*

TITRU2

Habit: Low to mid sized, 8-20 inches, deciduous, perennial forb, rhizomatous.

Leaves: Simple, 3-5 lobed, 2-3 inches long.

Flowers: White, 5-merous, bell-shaped in elongate panicles (Flowers: June - August).

Fruit: Conspicuous, unequally two-valved capsule.



Long-Stalked Clover

Trifolium longipes

TRLO

Family - Leguminosae

Range: British Columbia south to California on both sides of Cascades; Rocky Mountains from Montana to Utah and Colorado.

Habitat: Wet meadows, streamsides and coniferous forest.

Look Alikes: Difficult to distinguish without the flowers from other clovers (*Trifolium* spp.) in the forest. Dutch or white clover (*T. repens*) - white flowers; leaves and calyx not hairy. Red clover (*T. pratense*) - red flowers.

Indicator Value: Increases with trampling disturbance beneath forest canopies. Found in all coniferous forest series from subalpine fir to ponderosa pine. It is especially common where elk and cattle have congregated for thermal cover and ground has been disturbed.

Miscellany: Very nutritious. Nitrogen-fixing legume. Provides high quality forage to livestock and wildlife. Foliage used by marmots, rabbits. Seeds are eaten by blue and ruffed grouse, mountain and valley quail. Edible greens (cooked after soaking in saltwater); tea from the dried flowers. Can bloat grazing animals and humans if eaten in abundance.



Long-stalked Clover

Trifolium longipes

TRLO

Habit: Perennial forb with a taproot and long, slender rhizomes, patch forming.

Stems: Erect to trailing, 2-12 inches tall.

Leaves: Trifoliate (3 leaflets), hairy; elliptic to lanceolate, 3/4-2 inches long; serrated to entire; narrow leaflike stipules.

Flowers: Heads are terminal, globose on long peduncles; yellow-white to pinkish-white to white; calyx hairy (Flowers: May - August).

Fruit: Pods 1-4 seeded.



Sitka Valerian

Valeriana sitchensis

Family - Valerianaceae

Range: Eastern Washington, western Montana, northeastern Oregon, central Idaho.

Habitat: Cool, moist to cold, moist sites at high elevations with heavy snowpack.

Look Alikes: Very distinctive. Tobacco-root (*Valeriana edulis*) occurs at lower elevations; leaves lack a defined petiole; inflorescence a panicle.

Indicator Value: Indicator of the subalpine environmental zone. Commonly found in PIAL/RIMO2/POPU3, ABLA-PIEN/MEFE, ABLA-PIEN/LEGL, ABLA-PIEN/CLUN2, ABLA-PIEN/ARCO9, ABLA/VASC, ABLA/VAME, ABLA/CAGE2, ABLA/ARCO9 plant communities.

Miscellany: Sites will be difficult to regenerate. Highly palatable to sheep, deer, and elk. Roots are foul smelling and tasting.



Sitka Valerian

Valeriana sitchensis

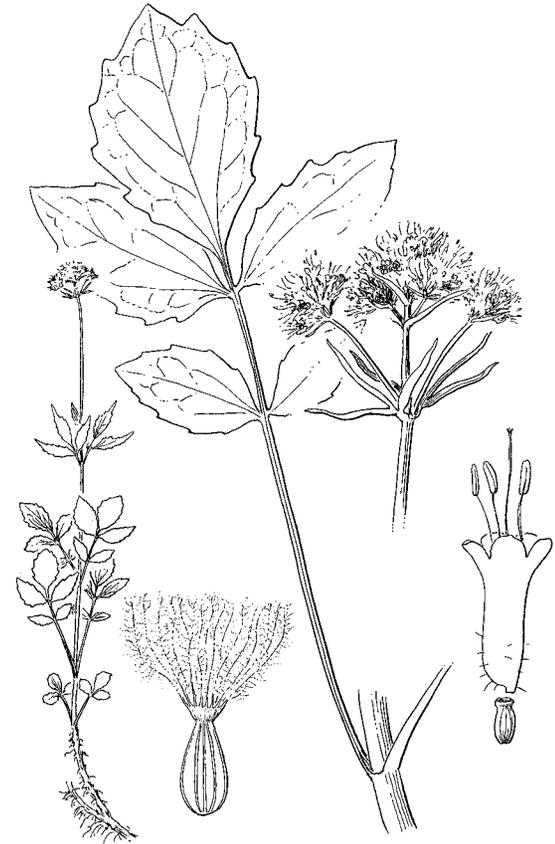
VASI

Habit: Deciduous, tall, 1-4 feet, perennial forb, fibrous-rooted from branched caudex.

Leaves: Opposite, odd-pinnately compound; toothed margins; terminal leaflet largest; most are cauline with petioles.

Flowers: White, funnel-shaped, borne in rounded compact inflorescence (Flowers: June - August).

Fruit: Glabrous, plumed achenes.



Green False Hellebore

Veratrum viride

Family - Liliaceae

Range: Alaska to the Olympic and Cascade Mountains of Washington to north Cascades of Oregon; east to Rocky Mountains of British Columbia and Alberta, south to Montana, Idaho and northeast Oregon.

Habitat: Meadows, moist to wet forests, and open slopes seeping from snowmelt.

Look Alikes: California false hellebore (*V. californicum*) - lower panicle branches erect (not drooping); flowers - white or greenish-white (not green or yellowish-green).

Indicator Value: Indicative of cold, moist environments in the subalpine. Occurs in whitebark pine/mountain gooseberry/skunkleaved polemonium (PIAL/RIMO2/POPU3) plant association. Strongly associated in subalpine fir (ABLA/VASC, ABLA/VAME), subalpine fir - whitebark pine (ABLA-PIAL/VASC/ARC09), and subalpine fir-Engelmann spruce (ABLA-PIEN/LEGL, ABLA-PIEN/CLUN2) plant associations.

Miscellany: Extremely poisonous (alkaloids) to livestock and humans - slows breathing and heartbeat; can result in death. Causes deformities in lambs. After frost wilts and browns the leaves - sheep will eat the plant to the ground without ill effects. Native Americans used a powder from the root to clear blocked nasal passages. The genus name "*veratrum*" means "truly black" - referring to the black rhizomes. The species name "*viride*" means "green" - referring to the flowers. Also called "cornlily," "cow cabbage," and "skunk cabbage" throughout the years since European settlement. Invades and dominates overgrazed and eroded meadows, forest openings, and mountain slopes.



Green False Hellebore

Veratrum viride

VEVI

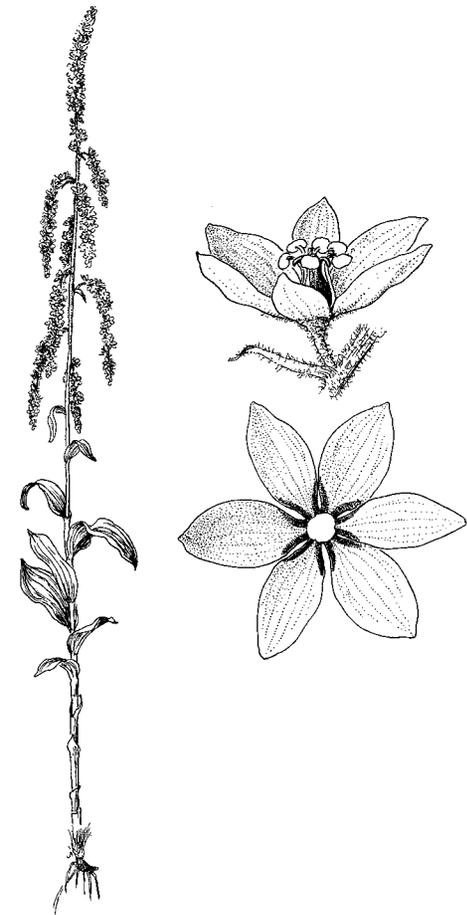
Habit: Perennial; short, stout rhizomes.

Stem: Tall stalks, up to 6 feet tall, glabrous below, hairy near inflorescence.

Leaves: Alternate, sessile, large, up to 12 inches long and 6 inches wide, oblong-elliptic, 3-5 prominent parallel veins, pleated, reduced upwards, clasping.

Flowers: Panicle, up to 25 inches long, open and loose, lower branches drooping. Perianth - yellow green to deep green; tepals - 6, about 1/2 inch long, woolly on outer side; stamens short, 6 in number (Flowers: July - September).

Fruit: Capsule-ovoid, straw colored to dark brown, 3-celled.



Cusick's Speedwell

Veronica cusickii

VECU

Family - Scrophulariaceae

Range: Willowa, Elkhorn, and Greenhorn Mountains of northeast Oregon; mountains of northern Idaho and Western Montana; Olympic and Cascade Mountains of Washington.

Habitat: Meadows, streambanks and lake margins. Moist, open grassland slopes and subalpine fir forests.

Look Alikes: Veronicas are differentiated by having 2 stamens and a 4-lobed irregular corolla (upper lobe largest). Other subalpine veronicas: *V. wormskjoldii* - leaves elliptic; style not exerted; hairless. *V. serpyllifolia* - elongate raceme; capsule wider than long.

Indicator Value: A strong associate with grouse huckleberry in subalpine fir forest stands (ABLA/VASC, ABLA/VASC-PHEM, ABLA-PIAL/VASC) and beneath Labrador tea (ABLA-PIEN/LEGL). A component of green fescue - Parry's rush (FEVI-JUPA) plant associations.

Miscellany: Named for William C. Cusick, pioneer botanist in the Blue and Willowa Mountains (1842-1922). The common name "speedwell" is from its use to heal wounds and prevent coughing.



Cusick's Speedwell

Veronica cusickii

VECU

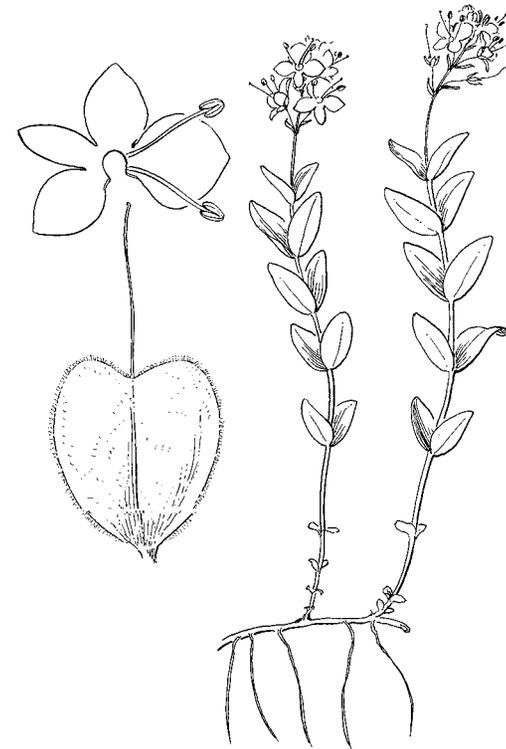
Habit: Perennial, shallow rhizomes.

Stem: Simple, erect, up to 8 inches tall; glandular, fine hairy.

Leaves: Opposite, elliptic to obovate, up to 1 inch long and 1/2 inch wide, sessile, entire, glabrous.

Flowers: Raceme, 3-9 flowered; pedicels - glandular, hairy; sepals - 4, glandular, hairy; corolla - deep blue-violet, up to 1/2 inch wide; style exerted conspicuously, 4-lobed (2 top petals are joined with 3 small petals below); 2 blue stamens (Flowers: July - August).

Fruit: Capsule - heart shaped (longer than wide).



Round-Leaved Violet

Viola orbiculata

Family - Violaceae

Range: Olympics, Cascades to northern Oregon; northern Idaho, northwest Montana, and northeastern Oregon.

Habitat: Cool, moist shaded sites at mid and upper elevations.

Look Alikes: Differentiate the following violets as follows: woodland violet (*Viola glabella*) has cordate-reniform leaves and pointed leaf tips; early blue violet (*V. adunca*) has ovate leaves with acute tip.

Indicator Value: Occurs beneath subalpine fir, grand fir, and mountain hemlock. Common in TSME/VASC, TSME/VAME, ABLA-PIEN/MEFE, ABLA-PIEN/LEGL, ABLA-PIEN/CLUN2, ABLA-PIEN/ARCO9, ABLA/VASC, ABLA/VAME, ABLA/ARCO9, and ABGR/VAME plant communities.

Miscellany: Unpalatable. Use leaves for salad greens - high in Vitamin C.

VIOR

Round-Leaved Violet

Viola orbiculata

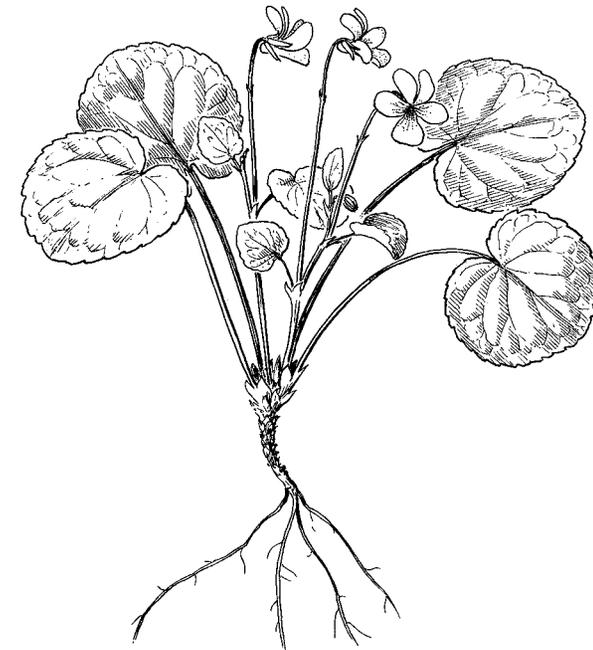
VIOR

Habit: Erect, deciduous, low perennial forb, 2 inches tall; short rootstock without stolons; old petiole bases exposed.

Leaves: Orbicular (round) with cordate base and round apex; glabrous, thin, small, 1-2 inches wide.

Flowers: Lemon-yellow to golden; lower three petals purple-veined (Flowers: May - August).

Fruit: Exploding capsule.



Beargrass

Xerophyllum tenax

Family - Liliaceae

Range: British Columbia to California; east to Rocky Mountains (British Columbia, Idaho, Montana). Occurs in the subalpine of the Seven Devils on the Salmon River - Snake River divide.

Habitat: Cold, moist to dry forest, and on open subalpine slopes.

Look Alikes: Singular. Leafy clumps could be mistaken for sedges if flower stalk is absent. Leaves of beargrass have razor-sharp edges; sedge leaves are toothless.

Indicator Value: Defines the subalpine fir/beargrass (ABLA/XETE) community and is often a component of subalpine fir-Engelmann spruce/fool's huckleberry (ABLA-PIEN/MEFE) plant association in the Seven Devils Mountains.

Miscellany: Blooms in 5 to 7-year cycles. Blooms little under forest canopy; blooms profusely in forest openings and on open slopes. Plants die after flowering and fruiting. Regeneration is primarily from sprouting off the rhizomes. Considered "long-lived" due to continued production of new shoots. Fire resistant. Increases with light burns; decreases when severe burns kill the rhizomes.

Flowers are relished by deer, bighorn sheep, and elk in early summer. In winter mountain goats eat the tough leaves. The common name "beargrass" is from use of leafy flowering stalks in springtime by bears.



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XETE

Native Americans used the new plants following fire for preferred basket weaving material as the leaves were more pliable, thinner, yet stronger than older leaves. Beargrass is also called Indian basket grass. "Xerophyllum" is Greek for "dry leaf," "tenax" means "hold fast" referring to the tough leaves.

Beargrass

Xerophyllum tenax

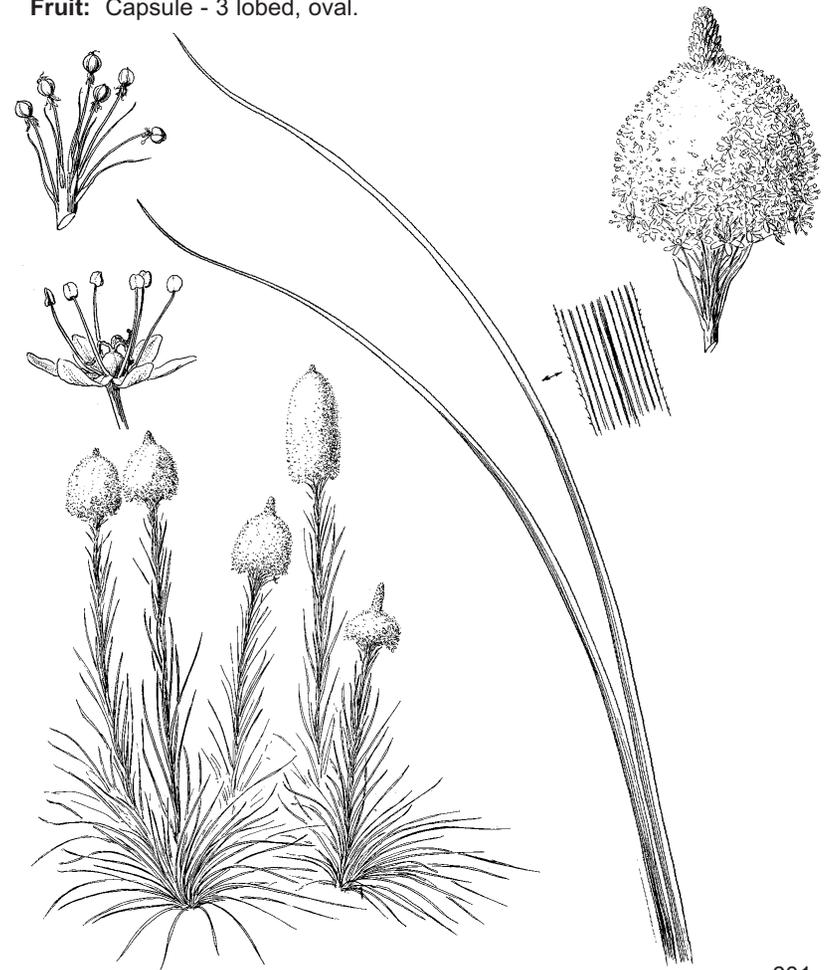
Habit: Perennial, evergreen, "grass-like"; thick, short rhizome, up to 3/4 inch thick; clump-forming.

Stem: Flowering stems, erect, stout, leafy (reduced upwards), up to 5 feet tall.

Leaves: Basal in large clumps; rigid, wiry, linear with sharp, fine teeth on the edges, 6-32 inches long. Cauline leaves reduced upwards, alternate, needle-like.

Flowers: Terminal raceme (cone-like); pedicels - up to 2 inches long; creamy-white small flowers. Perianth - rotate with 6 long tepals, 3/8 inch long; stamens - 6, equal or exceed perianth; fragrant (Flowers: June - August).

Fruit: Capsule - 3 lobed, oval.



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Glossary

Alpine - A zone or landmass above the natural high-altitude forest line with herb-dominated vegetation characterized by rocky ridgetops, fellfields, turf and scree communities of plants.

Climax (community) - The stable community in an ecological succession which is able to reproduce itself indefinitely under existing environmental conditions in the absence of disturbance. The final stage of succession.

Climax (species) - Species that are self-perpetuating in the absence of disturbance.

Climax (vegetation) - The pattern or complex of climax communities in a landscape corresponding to the pattern of environmental gradients or habitats.

Constancy - The percentage of frequency of occurrence of a species in the number of samples in the sampled population.

Coverage (Cover) - The percentage of ground area included in a vertical projection of individual plant canopies by a given species.

Depauperate - A stand with sparse ground covering vegetation due to 1) tree overstory density precluding sufficient light for understory plant growth, or 2) a deep restrictive litter of duff layer or, 3) a combination of limiting site factors.

Disclimax - A type of climax community which is maintained by either continuous or intermittent disturbance (i.e., grazing, burning, logging) to a severity that the natural climax community is altered.

Dominant - A plant or group of plants which by their collective size, mass, or number exert the most influence on other components of the ecosystem.

Fellfield - a land unit within an alpine ecosystem characterized by rather flat relief, very stony soil, and low, often widely spaced plants.

Forb - A herbaceous plant other than a sedge, grass, or other plant with similar grass-like foliage.

Graminoid - A herbaceous grass or grass-like plant.

Grass - a plant of the family Gramineae, characterized by jointed stems, sheathing leaves, flower spikelets, and fruit consisting of a seed like grain or caryopsis.

Herb - A plant that dies back to the ground surface each year.

Indicator Species - A plant species that is sensitive to environmental features of a site and have a high fidelity and constancy to a type.

Krummholz - A belt of discontinuous high-altitude tree growth that is

dense, often prostrate, and of a shrubby habit owing to wind and ice shearing.

Layer - The layer which defines the characteristic physiognomy of the vegetation (at any geographic or classification scale) being considered.

Plant Association - A recurring plant community with a characteristic range in species composition, specific diagnostic species, and a defined range in habitat conditions, physiognomy, and structure.

Plant Community - An assemblage of plants living together and interacting among themselves in a common spatial arrangement.

Plant Community Type - An aggregation of all plant communities with similar structure and floristic composition placed in a classification unit.

Scree - A steep-slope landform of rock and gravel-sized particles formed by weathering and mass-wasting on the side of a mountain.

Seral - A stage of temporary communities in a successional sequence.

Series - An aggregation of taxonomically related associations that takes the name of climax species that dominate the principal layer. A taxonomic unit in a classification.

Stand - Vegetation occupying a specific area and sufficiently uniform in species composition, age arrangement, structure and condition as to be distinguished from the vegetation on adjoining areas.

Subalpine -The zone below the alpine tree line in the higher montane landscape where cold temperatures dictate the kind of forest vegetation that can occur.

Succession - The unidirectional change in species composition resulting from the replacement of one community with another toward some stable end point. This may be progressive from early seral stages toward climax or retrogressive from late seral stages toward very early seral stages.

Talus - A steep-slope mass of rocky fragments at the base of a cliff or canyon.

Turf Community - An alpine site where strong winds and scouring cause promote dwarf graminoids or forbs to dominate over the exposed rocks and gravels.

Type - A term synonymous to the classified unit and used to facilitate readability of the text.

Ungulate - Cloven hooped animals.

Zone - The geographic area of uniform macroclimate where the climatic climax associations share the same characteristic species of the principal layer.

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APPENDIX A

Species List

<u>SCIENTIFIC NAME</u>	<u>PLANTS CODE</u>	<u>COMMON NAME</u>
TREES		
<i>Abies grandis</i>	ABGR	Grand fir or white fir
<i>Abies lasiocarpa</i>	ABLA	Subalpine fir
<i>Juniperus occidentalis</i>	JUOC	Western juniper
<i>Juniperus scopulorum</i>	JUSC2	Rocky Mountain juniper
<i>Larix occidentalis</i>	LAOC	Western larch or tamarack
<i>Picea engelmannii</i>	PIEN	Engelmann spruce
<i>Pinus albicaulis</i>	PIAL	Whitebark pine
<i>Pinus contorta</i>	PICO	Lodgepole pine
<i>Pinus flexilis</i>	PIFL2	Limber pine
<i>Pinus monticola</i>	PIMO3	Western white pine
<i>Pinus ponderosa</i>	PIPO	Ponderosa pine
<i>Populus tremuloides</i>	POTR5	Quaking aspen
<i>Pseudotsuga menziesii</i>	PSME	Douglas-fir or red fir
<i>Tsuga mertensiana</i>	TSME	Mountain hemlock
SHRUBS		
<i>Acer glabrum</i>	ACGL	Rocky Mountain maple
<i>Alnus sinuata</i>	ALS13	Sitka or thin-leaved alder
<i>Amelanchier alnifolia</i>	AMAL2	Western serviceberry
<i>Arctostaphylos nevadensis</i>	ARNE	Pinemat manzanita
<i>Artemisia arbuscula</i>	ARAR8	Low sagebrush
<i>Artemisia tridentata</i>	ARTR2	Big sagebrush
<i>Artemisia tridentata vaseyana</i>	ARTRV	Mountain big sagebrush
<i>Berberis repens</i>	BERE	Creeping Oregon-grape
<i>Cassiope mertensiana</i>	CAME7	Mountain heather
<i>Ceanothus velutinus</i>	CEVE	Snowbrush ceanothus
<i>Cercocarpus ledifolius</i>	CELE3	Curleaf mountain-mahogany
<i>Chimaphila menziesii</i>	CHME	Little pipsissewa
<i>Chimaphila umbellata</i>	CHUM	Prince's pine
<i>Chrysothamnus nauseosus</i>	CHNA2	Common or gray rabbitbrush
<i>Chrysothamnus viscidiflorus</i>	CHVI8	Green rabbitbrush
<i>Gaultheria humifusa</i>	GAHU	Alpine wintergreen
<i>Holodiscus discolor</i>	HODI	Creambush ocean-spray
<i>Juniperus communis</i>	JUCO6	Common juniper
<i>Ledum glandulosum</i>	LEGL	Labrador-tea
<i>Linnaea borealis</i>	LIBO3	Twinflower
<i>Lonicera involucrata</i>	LOIN5	Bearberry honeysuckle
<i>Lonicera utahensis</i>	LOUT2	Utah honeysuckle
<i>Menziesia ferruginea</i>	MEFE	Fool's huckleberry

<i>Pachistima myrsinites</i>	PAMY	Oregon boxwood or pachistima	<i>Agrostis variabilis</i>	AGVA	Variant bentgrass
<i>Phylodoce empetriformis</i>	PHEM	Pink mountain heath	<i>Arrhenatherum elatius</i>	AREL3	Tall oatgrass
<i>Physocarpus malvaceus</i>	PHMA5	Mallow ninebark	<i>Bromus</i>	BROMU	Brome
<i>Potentilla fruticosa</i>	POFR4	Shrubby cinquefoil	<i>Bromus brizaeformis</i>	BRBR7	Rattlesnake brome
<i>Prunus</i>	PRUNU	Cherry or chokecherry	<i>Bromus carinatus</i>	BRCA5	Mountain brome
<i>Prunus emarginata</i>	PREM	Bitter cherry	<i>Bromus inermis</i>	BRIN2	Smooth brome
<i>Prunus virginiana</i>	PRVI	Common chokecherry	<i>Bromus japonicus</i>	BRJA	Japanese brome
<i>Rhododendron albiflorum</i>	RHAL2	White rhododendron	<i>Bromus suksdorfii</i>	BRSU2	Suksdorf's brome
<i>Ribes</i>	RIBES	Currant or gooseberry	<i>Bromus tectorum</i>	BRTE	Cheatgrass
<i>Ribes cereum</i>	RICE	Squaw currant	<i>Bromus vulgaris</i>	BRVU	Columbia brome
<i>Ribes goodingii</i>	RIGO	Gooding's gooseberry	<i>Calamagrostis purpurascens</i>	CAPU	Purple reedgrass or purple pinegrass
<i>Ribes lacustre</i>	RILA	Swamp gooseberry	<i>Calamagrostis rubescens</i>	CARU	Pinegrass
<i>Ribes montigenum</i>	RIMO2	Mountain gooseberry	<i>Calamagrostis sesquiflora</i>	CASE24	One-and-a-half flowered reedgrass
<i>Ribes viscosissimum</i>	RIVI3	Sticky currant	<i>Cinna latifolia</i>	CILA2	Drooping woodreed
<i>Rosa</i>	ROSA5	Rose	<i>Dactylis glomerata</i>	DAGL	Orchard grass
<i>Rosa gymnocarpa</i>	ROGY	Baldhip or little wild rose	<i>Danthonia intermedia</i>	DAIN	Timber oatgrass
<i>Rubus idaeus</i>	RUID	Red raspberry	<i>Danthonia unispicata</i>	DAUN	One-spike oatgrass
<i>Rubus parviflorus</i>	RUPA	Thimbleberry	<i>Deschampsia atropurpurea</i>	DEAT2	Mountain hairgrass
<i>Salix</i>	SALIX	Willow	<i>Deschampsia caespitosa</i>	DECA18	Tufted hairgrass
<i>Salix nivalis saximontana</i>	SANIS	Rocky Mountain willow	<i>Deschampsia elongata</i>	DEEL	Slender hairgrass
<i>Salix scouleriana</i>	SASC	Scouler willow	<i>Elymus glaucus</i>	ELGL	Blue wildrye or western ryegrass
<i>Sambucus cerulea</i>	SACE3	Blue elderberry	<i>Elymus macounii</i>	ELMA9	Macoun's wildrye
<i>Sambucus racemosa</i>	SARA2	Black elderberry	<i>Festuca</i>	FESTU	Fescue
<i>Shepherdia canadensis</i>	SHCA	Canada buffaloberry	<i>Festuca idahoensis</i>	FEID	Idaho fescue
<i>Sorbus</i>	SORBU	Mountain-ash	<i>Festuca occidentalis</i>	FEOC	Western fescue
<i>Sorbus scopulina</i>	SOSC2	Cascade mountain-ash	<i>Festuca ovina</i>	FEOV	Sheep fescue
<i>Sorbus sitchensis</i>	SOSI2	Sitka mountain-ash	<i>Festuca ovina brachyphylla</i>	FEOVB4	Sheep fescue
<i>Spiraea betulifolia</i>	SPBE2	Birchleaf spiraea	<i>Festuca rubra</i>	FERU2	Red fescue
<i>Symphoricarpos albus</i>	SYAL	Common snowberry	<i>Festuca scabrella</i>	FESC	Rough fescue
<i>Symphoricarpos oreophilus</i>	SYOR2	Mountain snowberry	<i>Festuca viridula</i>	FEVI	Green fescue
<i>Vaccinium caespitosum</i>	VACA13	Dwarf huckleberry	<i>Koeleria cristata</i>	KOCR	Prairie junegrass
<i>Vaccinium membranaceum</i>	VAME	Big huckleberry	<i>Lolium</i>	LOLIU	Ryegrass
<i>Vaccinium scoparium</i>	VASC	Grouse huckleberry or whortleberry	<i>Lolium perenne</i>	LOPE	Perennial ryegrass
GRASSES			<i>Melica</i>	MELIC	Oniongrass
<i>Agropyron</i>	AGROP2	Wheatgrass	<i>Melica bulbosa</i>	MEBU	Oniongrass
<i>Agropyron caninum</i>	AGCA2	Bearded wheatgrass	<i>Melica fugax</i>	MEFU	Little oniongrass
<i>Agropyron caninum majus latiglume</i>	AGCAM2	Broadglumed wheatgrass	<i>Melica spectabilis</i>	MESP	Showy or purple oniongrass
<i>Agropyron caninum majus andinum</i>	AGCAA	Bearded wheatgrass	<i>Melica subulata</i>	MESU	Alaska oniongrass
<i>Agropyron caninum majus majus</i>	AGCAM	Slender wheatgrass	<i>Muhlenbergia filiformis</i>	MUF12	Pull-up or slender muhly
<i>Agropyron dasystachyum</i>	AGDA	Thick-spiked or downy wheatgrass	<i>Muhlenbergia richardsonis</i>	MURI	Mat muhly
<i>Agropyron intermedium</i>	AGIN2	Intermediate wheatgrass	<i>Oryzopsis exigua</i>	OREX	Little ricegrass
<i>Agropyron scribneri</i>	AGSC4	Spreading wheatgrass	<i>Phleum alpinum</i>	PHAL2	Alpine or mountain timothy
<i>Agropyron spicatum</i>	AGSP	Bluebunch wheatgrass	<i>Phleum pratense</i>	PHPR3	Common timothy
<i>Agrostis</i>	AGROS2	Bentgrass	<i>Poa</i>	POA	Bluegrass
<i>Agrostis humilis</i>	AGHU	Alpine bentgrass	<i>Poa alpina</i>	POAL2	Alpine bluegrass
<i>Agrostis oregonensis</i>	AGOR	Oregon bentgrass	<i>Poa bolanderi</i>	POBO	Bolander's bluegrass
<i>Agrostis scabra</i>	AGSC5	Rough or winter bentgrass	<i>Poa cusickii</i>	POCU3	Cusick's bluegrass
			<i>Poa cusickii epilis</i>	POCUE2	Skyline bluegrass
			<i>Poa gracillima</i>	POGR	Slender bluegrass

<i>Poa incurva</i>	POIN24	Curly bluegrass
<i>Poa leibergii</i>	POLE	Leiberg's bluegrass
<i>Poa nervosa</i>	PONE2	Wheeler's bluegrass
<i>Poa nervosa wheeleri</i>	PONEW	Wheeler's bluegrass
<i>Poa pratensis</i>	POPR	Kentucky bluegrass
<i>Poa sandbergii</i>	POSA12	Sandberg's bluegrass
<i>Poa secunda</i>	POSE	Sandberg's bluegrass
<i>Sitanion hystrix</i>	SIHY	Bottlebrush squirreltail
<i>Sitanion hystrix hordeoides</i>	SIHYH	Dwarf bottlebrush squirreltail
<i>Stipa</i>	STIPA	Needlegrass
<i>Stipa lemmonii</i>	STLE2	Lemmon's needlegrass
<i>Stipa lettermanii</i>	STLE4	Letterman's needlegrass
<i>Stipa occidentalis</i>	STOC2	Western needlegrass
<i>Stipa occidentalis californica</i>	STOCC	California needlegrass
<i>Stipa occidentalis minor</i>	STOCM	Small needlegrass
<i>Stipa occidentalis nelsonii</i>	STOCN	Nelson's needlegrass
<i>Stipa thurberiana</i>	STTH2	Thurber's needlegrass
<i>Trisetum</i>	TRISE	Trisetum
<i>Trisetum canescens</i>	TRCA21	Tall trisetum
<i>Trisetum spicatum</i>	TRSP2	Spike trisetum or downy oatgrass
<i>Trisetum wolfii</i>	TRWO3	Wolf's trisetum or beardless trisetum

GRASSLIKES

<i>Carex</i>	CAREX	Sedge
<i>Carex concinnoides</i>	CACO11	Northwestern sedge
<i>Carex eurycarpa</i>	CAEU2	Wide-fruit sedge
<i>Carex geyeri</i>	CAGE2	Elk sedge
<i>Carex hoodii</i>	CAHO5	Hood's sedge
<i>Carex illota</i>	CAIL	Sheep sedge
<i>Carex interior</i>	CAIN11	Inland sedge
<i>Carex laeviculmis</i>	CALA13	Smooth-stem sedge
<i>Carex lenticularis</i>	CALE8	Lenticular sedge
<i>Carex leporina</i>	CALE23	Hare sedge
<i>Carex leporinella</i>	CALE9	Sierra-hare sedge
<i>Carex luzulina</i>	CALU7	Woodrush sedge
<i>Carex microptera</i>	CAMI7	Smallwinged sedge
<i>Carex multicostata</i>	CAMU6	Many-ribbed sedge
<i>Carex nova</i>	CANO3	New sedge
<i>Carex pachystachya</i>	CAPA14	Thick-headed sedge
<i>Carex paysonis</i>	CAPA31	Payson's or short-stalked sedge
<i>Carex petasata</i>	CAPE7	Liddon's sedge
<i>Carex phaeocephala</i>	CAPH2	Dunhead sedge
<i>Carex praegracilis</i>	CAPR5	Clustered field sedge
<i>Carex preslii</i>	CAPR8	Presli's or thick-headed sedge
<i>Carex pyrenaica</i>	CAPY3	Pyrenian sedge
<i>Carex raynoldsii</i>	CARA6	Raynold's sedge
<i>Carex rossii</i>	CARO5	Ross sedge
<i>Carex scopulorum</i>	CASC12	Holm's Rocky Mountain sedge

<i>Carex siccata</i>	CASI12	Silvertop sedge
<i>Carex stramineiformis</i>	CAST7	Mt. Shasta sedge
<i>Carex subfusca</i>	CASU6	Rusty sedge
<i>Juncus confusus</i>	JUCO2	Colorado rush
<i>Juncus drummondii</i>	JUDR	Drummond's rush
<i>Juncus parryi</i>	JUPA	Parry's rush
<i>Juncus tenuis</i>	JUTE	Slender rush
<i>Kobresia bellardii</i>	KOBE	Bellard's kobresia
<i>Luzula</i>	LUZUL	Woodrush
<i>Luzula campestris</i>	LUCA2	Field woodrush
<i>Luzula glabrata</i>	LUGL2	Smooth woodrush
<i>Luzula hitchcockii</i>	LUHI4	Hitchcock's woodrush
<i>Luzula parviflora</i>	LUPA4	Smallflowered woodrush
<i>Luzula piperi</i>	LUPI2	Piper's woodrush
<i>Luzula spicata</i>	LUSP4	Spike woodrush
<i>Luzula wahlenbergii</i>	LUWA	Wahlenberg's rush

FORBS

<i>Achillea lanulosa</i>	ACLA5	Common yarrow
<i>Achillea millefolium lanulosa</i>	ACMIL	Common yarrow
<i>Aconitum columbianum</i>	ACCO4	Columbia monkshood
<i>Actaea rubra</i>	ACRU2	Wild red baneberry
<i>Adenocaulon bicolor</i>	ADBI	Trail plant or pathfinder
<i>Agastache urticifolia</i>	AGUR	Nettle leaf horsemint
<i>Agoseris</i>	AGOSE	False dandelion or agoseris
<i>Agoseris aurantiaca</i>	AGAU2	Orange agoseris
<i>Agoseris glauca</i>	AGGL	Pale agoseris
<i>Agoseris glauca agrestis</i>	AGGLA	Pale agoseris
<i>Agoseris glauca dasycephala</i>	AGGLD	Pale agoseris
<i>Agoseris glauca laciniata</i>	AGGLL	Pale agoseris
<i>Agoseris glauca monticola</i>	AGGLM	Pale agoseris
<i>Agoseris grandiflora</i>	AGGR	Large-flowered agoseris
<i>Allium</i>	ALLIU	Wild onion
<i>Allium acuminatum</i>	ALAC4	Tapertip onion
<i>Allium fibrillum</i>	ALFI	Fringed onion
<i>Allium madidum</i>	ALMA6	Swamp onion
<i>Allium tolmiei</i>	ALTO	Tolmie's onion
<i>Allium validum</i>	ALVA	Tall swamp onion
<i>Amaranthus</i>	AMARA	Pigweed
<i>Amsinckia retrorsa</i>	AMRE2	Rigid fiddleneck
<i>Anaphalis margaritacea</i>	ANMA	Common pearly-everlasting
<i>Anemone drummondii</i>	ANDR	Drummond's anemone
<i>Anemone multifida</i>	ANMU	Cliff anemone
<i>Anemone occidentalis</i>	ANOC6	Western pasqueflower
<i>Anemone piperi</i>	ANPI	Piper's anemone
<i>Angelica arguta</i>	ANAR3	Lyll's or sharptooth angelica
<i>Antennaria</i>	ANTEN	Everlasting or pussytoes
<i>Antennaria alpina</i>	ANAL4	Alpine pussytoes or everlasting

<i>Antennaria anaphaloides</i>	ANAN2	Tall pussytoes	<i>Aster alpigenus haydenii</i>	ASALH2	Alpine aster
<i>Antennaria corymbosa</i>	ANCO	Flat-topped pussytoes	<i>Aster campestris</i>	ASCA6	Western meadow aster
<i>Antennaria dimorpha</i>	ANDI2	Low pussytoes	<i>Aster chilensis</i>	ASCH2	California aster
<i>Antennaria lanata</i>	ANLA3	Wooly pussytoes	<i>Aster conspicuus</i>	ASCO3	Showy aster
<i>Antennaria luzuloides</i>	ANLU2	Woodrush pussytoes	<i>Aster foliaceus</i>	ASFO	Leafy aster
<i>Antennaria microphylla</i>	ANMI3	Rosy pussytoes	<i>Aster foliaceus apricus</i>	ASFOA	Leafy aster
<i>Antennaria racemosa</i>	ANRA	Slender everlasting	<i>Aster foliaceus cusickii</i>	ASFOC2	Cusick's leafy aster
<i>Antennaria umbrinella</i>	ANUM	Brown pussytoes or everlasting	<i>Aster foliaceus lyallii</i>	ASFOL	Leafy aster
<i>Apocynum androsaemifolium</i>	APAN2	Spreading or flytrap dogbane	<i>Aster foliaceus parryi</i>	ASFOP	Leafy aster
<i>Aquilegia formosa</i>	AQFO	Red or Sitka columbine	<i>Aster integrifolius</i>	ASIN3	Thick-stemmed or sticky aster
<i>Arabis</i>	ARABI2	Rockcress	<i>Aster modestus</i>	ASMO3	Few-flowered aster
<i>Arabis aculeolata</i>	ARAC4	Wall rockcress	<i>Aster occidentalis</i>	ASOC	Western mountain aster
<i>Arabis cusickii</i>	ARCU	Cusicks' rockcress	<i>Aster occidentalis occidentalis</i>	ASOCI	Western mountain aster
<i>Arabis divaricarpa</i>	ARDI2	Spreading pod rockcress	<i>Aster perelegans</i>	ASPE3	Elegant aster
<i>Arabis drummondii</i>	ARDR	Drummond's rockcress	<i>Astragalus</i>	ASTRA	Locoweed or milkvetch
<i>Arabis glabra</i>	ARGL	Towermustard	<i>Astragalus alpinus</i>	ASAL7	Alpine milkvetch
<i>Arabis hirsuta</i>	ARHI	Hairy rockcress	<i>Astragalus canadensis</i>	ASCA11	Canada milkvetch
<i>Arabis hirsuta glabrata</i>	ARHIG	Hairy rockcress	<i>Astragalus conjunctus</i>	ASCO11	Stiff milkvetch
<i>Arabis holboellii</i>	ARHO2	Holboell's rockcress	<i>Astragalus inflexus</i>	ASIN5	Hairy milkvetch
<i>Arabis holboellii pendulocarpa</i>	ARHOP2	Holboell's rockcress	<i>Astragalus kentrophyta</i>	ASKE	Thistle milkvetch
<i>Arabis holboellii retrofracta</i>	ARHOR	Holboell's rockcress	<i>Astragalus purshii</i>	ASPU9	Wooly-pod milkvetch
<i>Arabis lemmonii</i>	ARLE	Lemmon's rockcress	<i>Astragalus reventus</i>	ASRE5	Blue Mountain milkvetch
<i>Arabis lemmonii paddoensis</i>	ARLEP	Lemmon's rockcress	<i>Astragalus robbinsii alpiniformis</i>	ASROA	Robbins' milkvetch
<i>Arabis lyallii</i>	ARLY	Lyall's rockcress	<i>Astragalus sonneanus</i>	ASWH	Balloonpod milkvetch
<i>Arabis microphylla saximontana</i>	ARMI	Small-leaved rockcress	<i>Astragalus whitneyi</i>	ASWH	Balloon milkvetch
<i>Arabis puberula</i>	ARPU	Hoary rockcress	<i>Athyrium filix-femina</i>	ATFI	Lady fern
<i>Arabis sparsiflora</i>	ARSP	Elegant rockcress	<i>Balsamorhiza sagittata</i>	BASA3	Arrowleaf balsamroot
<i>Arabis suffrutescens</i>	ARSU2	Woody rockcress	<i>Balsamorhiza serrata</i>	BASE2	Serrate or toothed balsamroot
<i>Arenaria</i>	ARENA	Sandwort	<i>Brodiaea douglasii</i>	BRDO	Douglas' brodiaea or wild hyacinth
<i>Arenaria aculeata</i>	ARAC2	Prickly sandwort	<i>Bupleurum americanum</i>	BUAM2	American thorough-wax
<i>Arenaria capillaris</i>	ARCA7	Thread-leaved sandwort	<i>Calochortus</i>	CALOC	Mariposa or sego lily
<i>Arenaria congesta</i>	ARCO5	Ballhead sandwort	<i>Calochortus eurycarpus</i>	CAEU	Wide fruit or big pod mariposa
<i>Arenaria macrophylla</i>	ARMA18	Bigleaf sandwort	<i>Campanula rotundifolia sacajawean</i>	CARO2	Sacajawea's harebell
<i>Arenaria nuttallii</i>	ARNU5	Nuttall's sandwort	<i>Cardamine cordifolia lyallii</i>	CACO6	Large mountain bittercress
<i>Arenaria nuttallii fragilis</i>	ARNUF	Nuttall's sandwort	<i>Castilleja</i>	CASTI2	Paintbrush
<i>Arnica</i>	ARNIC	Arnica	<i>Castilleja applegatei</i>	CAAP4	Wavy-leaved paintbrush
<i>Arnica cordifolia</i>	ARCO9	Heartleaf arnica	<i>Castilleja applegatei fragilis</i>	CAAPF	Wavy-leaved paintbrush
<i>Arnica latifolia</i>	ARLA8	Mountain arnica	<i>Castilleja arachnoidea</i>	CAAR11	Cobwebby paintbrush
<i>Arnica latifolia latifolia</i>	ARLA8	Mountain arnica	<i>Castilleja chromosa</i>	CACH7	Desert paintbrush
<i>Arnica longifolia</i>	ARLO6	Longleaf arnica	<i>Castilleja chrysantha</i>	CACH16	Common Wallowa or yellow paintbrush
<i>Arnica mollis</i>	ARMO4	Hairy arnica	<i>Castilleja cusickii</i>	CACU7	Cusick's paintbrush
<i>Arnica parryi</i>	ARPA13	Nodding arnica	<i>Castilleja fraterna</i>	CAFR8	Fraternal or limestone paintbrush
<i>Arnica sororia</i>	ARSO2	Twin arnica	<i>Castilleja glandulifera</i>	CAGL10	Glandular paintbrush
<i>Artemisia dracuncululus</i>	ARDR4	Tarragon or dragon sagewort	<i>Castilleja gracillima</i>	CAGR16	Slender paintbrush
<i>Artemisia ludoviciana</i>	ARLU	Western mugwort	<i>Castilleja linariaefolia</i>	CALI4	Narrow-leaved paintbrush
<i>Artemisia ludoviciana incompta</i>	ARLUI2	Western mugwort	<i>Castilleja miniata</i>	CAMI12	Scarlet paintbrush
<i>Artemisia tilesii</i>	ARTI	Tiles' mugwort	<i>Castilleja oresbia</i>	CAOR4	Pale Wallowa paintbrush
<i>Aspidotis densa</i>	ASDE6	Podfern	<i>Castilleja rhexifolia</i>	CARH4	Alpine paintbrush
<i>Aster</i>	ASTER	Aster	<i>Castilleja rubida</i>	CARU8	Purple alpine paintbrush
<i>Aster alpigenus</i>	ASAL2	Alpine aster			

<i>Castilleja viscidula</i>	CAVI9	Sticky paintbrush	<i>Descurainia pinnata</i>	DEPI	Tansymustard
<i>Cerastium arvense</i>	CEAR4	Field chickweed or starry cerastium	<i>Descurainia richardsonii</i>	DERI2	Mountain tansymustard
<i>Cerastium beeringianum</i>	CEBE2	Alpine chickweed	<i>Descurainia richardsonii sonnei</i>	DERIS	Mountain tansymustard
<i>Cerastium vulgatum</i>	CEVU	Common chickweed	<i>Descurainia richardsonii viscosa</i>	DERIV	Mountain tansymustard
<i>Chaenactis alpina</i>	CHAL2	Alpine chaenactis	<i>Disporum trachycarpum</i>	DITR2	Fairybells, sierra fairybells
<i>Chaenactis douglasii</i>	CHDO	Hoary chaenactis or false yarrow	<i>Dodecatheon</i>	DODEC	Shootingstar
<i>Cheilanthes gracillima</i>	CHGR	Lace lipfern	<i>Draba</i>	DRABA	Whitlow-grass or draba
<i>Chenopodium fremontii</i>	CHFR3	Fremont's lamb's quarters	<i>Draba densifolia</i>	DRDE	Nuttall's draba
<i>Chionophila tweedyi</i>	CHTW	Chionophila	<i>Draba lanceolata</i>	DRLA2	Lance-leaved draba
<i>Circaea alpina</i>	CIAL	Enchanter's nightshade	<i>Draba lonchocarpa</i>	DRLO	Lance-fruit draba
<i>Cirsium</i>	CIRSI	Thistle	<i>Draba oligosperma</i>	DROL	Few seeded draba
<i>Cirsium arvense</i>	CIAR4	Canada thistle	<i>Draba oligosperma oligosperma</i>	DROL	Few seeded draba
<i>Cirsium brevifolium</i>	CIBR	Palouse thistle	<i>Draba paysonii</i>	DRPA	Payson's draba
<i>Cirsium utahense</i>	CIUT	Utah thistle	<i>Draba stenoloba</i>	DRST2	Slender draba
<i>Cirsium vulgare</i>	CIVU	Common or bull thistle	<i>Dryas octopetala</i>	DROC	White dryas
<i>Clarkia pulchella</i>	CLPU	Clarkia or pink fairies	<i>Dryas octopetala hookeriana</i>	DROCH	White dryas
<i>Clarkia rhomboidea</i>	CLRH	Common or rhombic-petaled clarkia	<i>Epilobium</i>	EPILO	Willow-herb or epilobium
<i>Clematis</i>	CLEMA	Clematis	<i>Epilobium alpinum</i>	EPAL	Alpine willow-herb
<i>Clematis columbiana</i>	CLCO2	Columbia clematis or virgins bower	<i>Epilobium alpinum gracillimum</i>	EPALG	Alpine willow-herb
<i>Clematis hirsutissima</i>	CLHI	Sugar bowls	<i>Epilobium alpinum lactiflorum</i>	EPALL2	Alpine willow-herb
<i>Clintonia uniflora</i>	CLUN2	Queen's cup or beadlily	<i>Epilobium angustifolium</i>	EPAN2	Fireweed
<i>Collinsia parviflora</i>	COPA3	Small flowered blue-eyed mary	<i>Epilobium glaberrimum</i>	EPGL	Smooth epilobium
<i>Collomia grandiflora</i>	COGR4	Large-flowered collomia	<i>Epilobium glaberrimum fastigiatum</i>	EPGLF	Smooth epilobium
<i>Collomia linearis</i>	COLI2	Narrow-leaved collomia	<i>Epilobium glandulosum</i>	EPGL4	Common willow-herb
<i>Coptis occidentalis</i>	COOC	Western or Idaho goldthread	<i>Epilobium latifolium</i>	EPLA	Red willow-herb
<i>Corallorhiza maculata</i>	COMA4	Pacific or spotted coral root	<i>Epilobium minutum</i>	EPMI	Small-flowered willow-herb
<i>Corallorhiza mertensiana</i>	COME4	Western coral root	<i>Epilobium obcordatum</i>	EPOB	Rose willow-herb
<i>Cordylanthus capitatus</i>	COCA7	Clustered or Yakima birdbeak	<i>Epilobium paniculatum</i>	EPPA2	Tall annual willow-weed
<i>Crepis</i>	CREPI	Hawksbeard	<i>Epilobium watsonii</i>	EPWA3	Watson's willow-herb
<i>Crepis acuminata</i>	CRAC2	Long-leaved or tapertip hawksbeard	<i>Epilobium watsonii parishii</i>	EPWAP2	Watson's willow-herb
<i>Crepis atrabarba</i>	CRAT	Slender hawksbeard	<i>Equisetum</i>	EQUIS	Horsetail or scouring rush
<i>Crepis intermedia</i>	CRIN4	Gray hawksbeard	<i>Erigeron</i>	ERIGE2	Daisy or fleabane
<i>Crepis occidentalis</i>	CROC	Western hawksbeard	<i>Erigeron bloomeri</i>	ERBL	Scabland fleabane
<i>Cryptantha affinis</i>	CRAF	Slender cryptantha	<i>Erigeron chrysopsidis</i>	ERCH4	Dwarf yellow fleabane or golden daisy
<i>Cryptantha celosioides</i>	CRCE	Cockscomb cryptantha	<i>Erigeron chrysopsidis brevifolius</i>	ERCHB	Alpine dwarf yellow fleabane
<i>Cryptantha torreyana</i>	CRT04	Torrey's cryptantha	<i>Erigeron compositus</i>	ERCO4	Cut-leaved daisy
<i>Cryptogramma crispa</i>	CRCR10	Rock brake	<i>Erigeron compositus discoideus</i>	ERCOD	Cut-leaved daisy
<i>Cymopterus bipinnatus</i>	CYBI	Hayden's cymopterus	<i>Erigeron compositus glabratus</i>	ERCOG	Cut-leaved daisy
<i>Cymopterus nivalis</i>	CYNI3	Snowline cymopterus	<i>Erigeron coulteri</i>	ERCO6	Coulter's daisy or fleabane
<i>Cymopterus terebinthinus</i>	CYTE9	Turpentine cymopterus	<i>Erigeron eatonii</i>	EREA	Eaton's daisy
<i>Cymopterus terebinthinus foeniculaceus</i>	CYTEF	Turpentine cymopterus	<i>Erigeron eatonii villosus</i>	EREAV	Eaton's daisy
<i>Cymopterus terebinthinus terebinthinus</i>	CYTEP	Turpentine cymopterus	<i>Erigeron filifolius</i>	ERFI2	Thread-leaved fleabane
<i>Cynoglossum officinale</i>	CYOF	Common houndstongue	<i>Erigeron peregrinus</i>	ERPE3	Subalpine daisy
<i>Cystopteris fragilis</i>	CYFR2	Brittle bladder-fern	<i>Erigeron peregrinus callianthemus</i>	ERPEC	Subalpine daisy
<i>Delphinium</i>	DELPH	Larkspur or delphinium	<i>Erigeron simplex</i>	ERSI3	Alpine daisy
<i>Delphinium depauperatum</i>	DEDE2	Slim or dwarf larkspur	<i>Erigeron speciosus</i>	ERSP4	Showy fleabane
<i>Delphinium nuttallianum</i>	DENU2	Upland larkspur	<i>Erigeron speciosus macranthus</i>	ERSPM	Showy fleabane
<i>Descurainia</i>	DESCU	Western tansymustard	<i>Eriogonum</i>	ERIOG	Buckwheat or eriogonum
			<i>Eriogonum caespitosum</i>	ERCA8	Cushion or mat buckwheat

<i>Eriogonum douglasii</i>	ERDO	Douglas' buckwheat	<i>Habenaria unalascensis</i>	HAUN	Alaskan bog-orchid
<i>Eriogonum flavum</i>	ERFL4	Golden buckwheat	<i>Hackelia</i>	HACKE	Stickseed or hackelia
<i>Eriogonum heracleoides</i>	ERHE2	Creamy or Wyeth's buckwheat	<i>Hackelia floribunda</i>	HAFL2	Many flowered stickseed
<i>Eriogonum ovalifolium</i>	EROV	Oval-leaved eriogonum	<i>Hackelia jessicae</i>	HAJE	Blue stickseed
<i>Eriogonum ovalifolium nivale</i>	EROVN	Oval-leaved eriogonum	<i>Haplopappus acaulis</i>	HAAC	Stemless goldenweed
<i>Eriogonum spergulinum reddingianum</i>	ERSPR	Spurry buckwheat	<i>Haplopappus carthamoides</i>	HACA5	Large-flowered goldenweed or Columbia goldenweed
<i>Eriogonum sphaerocephalum</i>	ERSP7	Rock buckwheat or round-headed eriogonum	<i>Haplopappus greenei</i>	HAGR6	Green's goldenweed
<i>Eriogonum strictum</i>	ERST4	Strict buckwheat or Blue Mountain eriogonum	<i>Haplopappus lanuginosus</i>	HALA3	Wooly goldenweed
<i>Eriogonum strictum proliferum</i>	ERSTP	Canyon strict buckwheat	<i>Haplopappus lyallii</i>	HALY	Lyall's goldenweed
<i>Eriogonum umbellatum</i>	ERUM	Sulfurflower or sulfur buckwheat	<i>Hedysarum boreale</i>	HEBO	Northern hedysarum
<i>Eriogonum umbellatum stellatum</i>	ERUMS5	Sulfurflower or sulfur buckwheat	<i>Helianthella uniflora</i>	HEUN	Little sunflower
<i>Eriophyllum lanatum</i>	ERLA6	Woolly eriophyllum	<i>Helianthella uniflora douglasii</i>	HEUND	Rocky Mountain helianthella
<i>Eritrichium nanum</i>	ERNA	Alpine forget-me-not	<i>Heracleum lanatum</i>	HELA4	Cow-parsnip
<i>Erysimum</i>	ERYSI	Wallflower	<i>Heuchera cylindrica</i>	HECY2	Roundleaved or lava alumroot
<i>Erysimum asperum</i>	ERAS2	Rough wallflower	<i>Heuchera cylindrica alpina</i>	HECYA	Alpine roundleaved alumroot
<i>Erysimum capitatum</i>	ERCA14	Wallflower	<i>Heuchera cylindrica glabella</i>	HECYG	Roundleaved alumroot
<i>Erysimum repandum</i>	ERRE4	Spreading wallflower	<i>Heuchera grossularifolia</i>	HEGR8	Gooseberry-leaved alumroot
<i>Erythronium grandiflorum</i>	ERGR9	Dogtooth violet or yellow fawnlily	<i>Heuchera grossulariifolia grossulariifolia</i>	HEGRG	Gooseberry-leaved alumroot
<i>Filago arvensis</i>	FIAR2	Field filago	<i>Hieracium</i>	HIERA	Hawkweed
<i>Fragaria vesca</i>	FRVE	Woods strawberry	<i>Hieracium albertinum</i>	HIAL	Western hawkweed
<i>Fragaria vesca crinita</i>	FRVEC	Woods strawberry	<i>Hieracium albiflorum</i>	HIAL2	White-flowered hawkweed
<i>Fragaria virginiana</i>	FRVI	Blueleaf strawberry	<i>Hieracium cynoglossoides</i>	HICY	Houndstongue hawkweed
<i>Fragaria virginiana platypetala</i>	FRVIP2	Blueleaf strawberry	<i>Hieracium gracile</i>	HIGR	Slender or alpine hawkweed
<i>Frasera albicaulis</i>	FRAL2	White stemmed frasera	<i>Horkelia</i>	HORKE	Horkelia
<i>Frasera albicaulis cusickii</i>	FRALC2	Cusick's frasera	<i>Horkelia fusca</i>	HOFU	Tawny horkelia
<i>Frasera speciosa</i>	FRSP	Giant frasera	<i>Hulsea algida</i>	HUAL	Alpine hulsea
<i>Fritillaria atropurpurea</i>	FRAT	Checker lily or purple fritillaria	<i>Hydrophyllum capitatum</i>	HYCA4	Waterleaf or wooly breeches
<i>Galium aparine</i>	GAAP2	Cleavers or goose-grass	<i>Hymenoxys grandiflora</i>	HYGR5	Old man of the mountains
<i>Galium aspernum</i>	GAAS3	Rough bedstraw	<i>Hypericum formosum</i>	HYFO4	Western St. John's wort
<i>Galium bifolium</i>	GABI	Thinleaf bedstraw	<i>Hypopitys monotropa</i>	HYMO3	Fringed pinesap
<i>Galium multiflorum</i>	GAMU2	Shrubby or many-flowered bedstraw	<i>Iliamna rivularis</i>	ILRI	Streambank globemallow
<i>Galium trifidum</i>	GATR2	Small bedstraw	<i>Ivesia gordonii</i>	IVGO	Gordon's ivesia
<i>Galium triflorum</i>	GATR3	Sweet-scented or fragrant bedstraw	<i>Kelloggia galioides</i>	KEGA	Kelloggia
<i>Gayophytum</i>	GAYOP	Groundsmoke	<i>Lactuca serriola</i>	LASE	Prickly lettuce
<i>Gayophytum decipiens</i>	GADE2	Deceptive groundsmoke	<i>Lathyrus pauciflorus</i>	LAPA5	Few-flowered peavine
<i>Gayophytum diffusum</i>	GADI2	Spreading groundsmoke	<i>Lepidium densiflorum</i>	LEDE	Prairie pepperweed
<i>Gentiana calycosa</i>	GECA	Mountain bog gentian	<i>Lesquerella occidentalis</i>	LEOC	Western bladderpod
<i>Geranium viscosissimum</i>	GEVI2	Sticky geranium	<i>Lesquerella occidentalis diversifolia</i>	LEOCD	Western bladderpod
<i>Geum</i>	GEUM	Avens	<i>Lewisia columbiana wallowensis</i>	LECOW2	Wallowa lewisia
<i>Geum macrophyllum perincisum</i>	GEMAP2	Large-leaved avens	<i>Lewisia pygmaea</i>	LEPY2	Dwarf lewisia
<i>Geum triflorum</i>	GETR	Red avens, Old man's whiskers	<i>Lewisia rediviva</i>	LERE7	Bitterroot
<i>Gilia aggregata</i>	GIAG	Scarlet gilia or skyrocket	<i>Ligusticum</i>	LIGUS	Lovage or licorice-root
<i>Gilia congesta</i>	GICO2	Ballhead gilia	<i>Ligusticum canbyi</i>	LICA2	Canby's lovage
<i>Gilia congesta viridis</i>	GICOV2	Ballhead gilia	<i>Ligusticum filicinum</i>	LIFI	Fernleaf lovage
<i>Goodyera oblongifolia</i>	GOOB2	Western rattlesnake plantain	<i>Ligusticum filicinum tenuifolium</i>	LIFIT	Fernleaf lovage
<i>Grindelia squarrosa</i>	GRSQ	Gumweed	<i>Ligusticum grayi</i>	LIGR	Gray's lovage
<i>Habenaria saccata</i>	HASA	Slender bog-orchid	<i>Ligusticum tenuifolium</i>	LITE2	Slender-leaved lovage
			<i>Linanthastrum nuttallii</i>	LINU4	Nuttall's linanthastrum

<i>Linanthus harknessii</i>	LIHA	Harkness' linanthus	<i>Montia perfoliata</i>	MOPE3	Miner's lettuce
<i>Linum perenne lewisii</i>	LIPEL3	Wild blue flax	<i>Montia sibirica</i>	MOSI2	Siberian montia
<i>Listera</i>	LISTE	Listera or twayblade	<i>Myosotis scorpioides</i>	MYSC	Common forget-me-not
<i>Listera caurina</i>	LICA10	Western or northwest twayblade	<i>Navarretia intertexta propinqua</i>	NAINP3	Pin cushion plant
<i>Listera cordata</i>	LICO6	Heart-leaf twayblade	<i>Oenothera heterantha</i>	OEHE	Long leaf evening-primrose
<i>Lithophragma parviflora</i>	LIPAP3	Small-flowered fringecup	<i>Oenothera hookeri</i>	OEHO	Hooker's evening primrose
<i>Lithospermum ruderales</i>	LIRU4	Wayside gromwell	<i>Osmorhiza</i>	OSMOR	Sweet-cicely or sweetroot
<i>Lloydia serotina</i>	LLSE	Alpine lilly	<i>Osmorhiza chilensis</i>	OSCH	Mountain sweet-cicely
<i>Lomatium</i>	LOMAT	Lomatium or biscuitroot or desert-parsley	<i>Osmorhiza depauperata</i>	OSDE	Blunt-fruit sweet cicely
			<i>Osmorhiza occidentalis</i>	OSOC	Western sweetroot
<i>Lomatium cusickii</i>	LOCU	Cusick's lomatium	<i>Osmorhiza purpurea</i>	OSPU	Purple sweet cicely
<i>Lomatium dissectum eatonii</i>	LODIE	Fern-leaved lomatium	<i>Oxytropis campestris cusickii</i>	OXCAC3	Cusick's crazyweed
<i>Lomatium grayi</i>	LOGR	Gray's lomatium	<i>Oxytropis campestris gracilis</i>	OXCAG4	Cusick's crazyweed
<i>Lomatium greenmanii</i>	LOGR2	Greenman's lomatium	<i>Oxytropis viscida</i>	OXVI2	Sticky crazyweed
<i>Lomatium macrocarpum</i>	LOMA3	Large-fruited lomatium	<i>Parnassia fimbriata</i>	PAFI3	Fringed grass-of-Parnassas
<i>Lomatium oregonum</i>	LOOR3	Blue Mountain lomatium	<i>Pedicularis</i>	PEDIC	Lousewort or pedicularis
<i>Lomatium triternatum</i>	LOTR2	Nine-leaf lomatium	<i>Pedicularis bracteosa</i>	PEBR	Bracted lousewort
<i>Lupinus</i>	LUPIN	Lupine	<i>Pedicularis bracteosa pachyrhiza</i>	PEBRP	Bracted lousewort
<i>Lupinus argenteus</i>	LUAR3	Silvery lupine	<i>Pedicularis contorta</i>	PECO	White coiled-beak lousewort
<i>Lupinus caudatus</i>	LUCA	Tailcup lupine	<i>Pedicularis groenlandica</i>	PEGR2	Pink elephants or elephant's head
<i>Lupinus laxiflorus</i>	LULA3	Spurred lupine	<i>Pedicularis racemosa</i>	PERA	Leafy or sickletop lousewort
<i>Lupinus lepidus</i>	LULE2	Prairie lupine	<i>Pedicularis racemosa alba</i>	PERAA	Leafy or sickletop lousewort
<i>Lupinus lepidus utahensis</i>	LULEU2	Prairie lupine	<i>Penstemon</i>	PENST	Penstemon or beardtongue
<i>Lupinus leucophyllus</i>	LULE3	Velvet lupine	<i>Penstemon attenuatus</i>	PEAT3	Taperleaved penstemon
<i>Lupinus leucophyllus leucophyllus</i>	LULEL4	Velvet lupine	<i>Penstemon attenuatus militaris</i>	PEATM	Taperleaved penstemon
<i>Lupinus leucophyllus lobbii</i>	LULEL3	Velvet lupine	<i>Penstemon attenuatus pseudoprocerus</i>	PEATP2	Taperleaved penstemon
<i>Lupinus sericeus</i>	LUSE4	Silky lupine			
<i>Lupinus sericeus sericeus</i>	LUSES2	Silky lupine	<i>Penstemon confertus</i>	PECO6	Yellow penstemon
<i>Machaeranthera canescens</i>	MACA2	Hoary aster	<i>Penstemon davidsonii</i>	PEDA2	Davidson's penstemon
<i>Madia</i>	MADIA	Tarweed or madia	<i>Penstemon deustus</i>	PEDE4	Hot rock penstemon
<i>Madia glomerata</i>	MAGL2	Cluster tarweed	<i>Penstemon deustus variabilis</i>	PEDEV	Hot rock penstemon
<i>Mentzelia dispersa</i>	MEDI	Bush mentzelia	<i>Penstemon fruticosus</i>	PEFR3	Shrubby or bush penstemon
<i>Mertensia</i>	MERTE	Bluebells	<i>Penstemon fruticosus serratus</i>	PEFRS4	Shrubby or bush penstemon
<i>Mertensia ciliata</i>	MECI3	Ciliate bluebells or broadleaved bluebells	<i>Penstemon glandulosus</i>	PEGL4	Glandular or sticky-stem penstemon
<i>Mertensia paniculata</i>	MEPA	Tall bluebells	<i>Penstemon globosus</i>	PEGL5	Globe penstemon
<i>Mertensia paniculata borealis</i>	MEPAB	Tall bluebells	<i>Penstemon humilis</i>	PEHU	Lowly penstemon
<i>Microseris</i>	MICRO6	Microseris	<i>Penstemon payettensis</i>	PEPA29	Payette penstemon
<i>Microseris nutans</i>	MINU	Nodding microseris	<i>Penstemon procerus</i>	PEPR2	Small flowered penstemon
<i>Microseris troximoides</i>	MITR5	False agoseris	<i>Penstemon procerus formosus</i>	PEPRF	Small flowered penstemon
<i>Microsteris gracilis</i>	MIGR	Pink microsteris	<i>Penstemon rydbergii</i>	PERY	Rydberg's penstemon
<i>Mimulus guttatus</i>	MIGU	Yellow monkeyflower	<i>Penstemon spatulatus</i>	PESP2	Wallowa penstemon
<i>Mimulus lewisii</i>	MILE2	Lewis' monkeyflower	<i>Penstemon speciosus</i>	PESP	Showy penstemon
<i>Mimulus moschatus</i>	MIMO3	Muskplant monkeyflower	<i>Penstemon venustus</i>	PEVE2	Blue Mountain penstemon
<i>Mimulus nanus</i>	MINA	Dwarf purple monkeyflower	<i>Penstemon wilcoxii</i>	PEWI	Wilcox's penstemon
<i>Mitella pentandra</i>	MIPE	Alpine mitrewort or bishop's cap	<i>Perideridia</i>	PERID	Yampah
<i>Mitella stauropetala</i>	MIST3	Side-flowered mitrewort	<i>Perideridia gairdneri</i>	PEGA3	Gairdner's yampah
<i>Mitella trifida</i>	MITR4	Three-toothed mitrewort	<i>Phacelia</i>	PHACE	Phacelia
<i>Monardella odoratissima</i>	MOOD	Mountain monardella or balm	<i>Phacelia hastata</i>	PHHA	Silverleaf phacelia
			<i>Phacelia hastata alpina</i>	PHHAA	Silverleaf phacelia

<i>Phacelia hastata leptosepala</i>	PHHAL	Silverleaf phacelia	<i>Rorippa curvisiliqua</i>	ROCU	Western yellowcress
<i>Phacelia heterophylla</i>	PHHE2	Varileaf phacelia	<i>Rudbeckia occidentalis</i>	RUOC2	Western coneflower
<i>Phacelia linearis</i>	PHLI	Threadleaf phacelia	<i>Rumex</i>	RUMEX	Sorrel or dock
<i>Phacelia sericea</i>	PHSE	Silky phacelia	<i>Rumex acetosella</i>	RUAC3	Red or sheep sorrel
<i>Phlox</i>	PHLOX	Phlox	<i>Sanicula graveolens</i>	SAGR5	Sierra sanicle
<i>Phlox austromontana</i>	PHAU3	Mountain phlox	<i>Saussurea americana</i>	SAAM3	American sawwort
<i>Phlox caespitosa</i>	PHCA7	Tufted or clumped phlox	<i>Saxifraga arguta</i>	SAAR13	Brook saxifrage
<i>Phlox colubrina</i>	PHCO10	Snake River phlox	<i>Saxifraga bronchialis austromontana</i>		
<i>Phlox diffusa</i>	PHDI3	Spreading phlox		SABRA2	Matted saxifrage
<i>Phlox diffusa longistylis</i>	PHDIL5	Spreading phlox	<i>Saxifraga caespitosa</i>	SACA50	Tufted saxifrage
<i>Phlox hoodii</i>	PHHO	Hood's phlox	<i>Saxifraga integrifolia</i>	SAIN4	Swamp saxifrage
<i>Phlox pulvinata</i>	PHPU5	Cushion phlox	<i>Saxifraga mertensiana</i>	SAME7	Wood or Mertens saxifrage
<i>Phoenicaulis cheiranthoides</i>	PHCH	Daggerpod	<i>Saxifraga rhomboidea</i>	SARH2	Diamondleaf saxifrage
<i>Plantago elongata</i>	PLEL	Slender plantain	<i>Sedum</i>	SEDUM	Stonecrop
<i>Polemonium</i>	POLEM	Polemonium	<i>Sedum lanceolatum</i>	SELA	Lanceleaved stonecrop
<i>Polemonium pulcherrimum</i>	POPU3	Skunk-leaved polemonium	<i>Sedum rosea</i>	SEROA	King's crown
<i>Polemonium pulcherrimum calycinum</i>	POPUC	Skunk-leaved polemonium	<i>Sedum stenopetalum</i>	SEST2	Wormleaf stonecrop
<i>Polygonum</i>	POLYG4	Knotweed, pokeweed or fleeceflower	<i>Senecio</i>	SENEC	Groundsel or butterweed or ragwort
<i>Polygonum bistortoides</i>	POBI6	American or western bistort	<i>Senecio canus</i>	SECA2	Wooly groundsel
<i>Polygonum douglasii</i>	PODO4	Douglas' knotweed	<i>Senecio crassulus</i>	SECR	Thick-leaved groundsel
<i>Polygonum majus</i>	POMA9	Wiry or Palouse knotweed	<i>Senecio integerrimus</i>	SEIN2	Western groundsel
<i>Polygonum minimum</i>	POMI2	Leafy dwarf knotweed	<i>Senecio integerrimus exaltatus</i>	SEINE	Western groundsel
<i>Polygonum phytolaccaefolium</i>	POPH	Alpine knotweed or fleeceflower	<i>Senecio pseud aureus</i>	SEPS2	Streambank butterweed
<i>Polygonum polygaloides</i>	POPO4	White-margined knotweed	<i>Senecio serra</i>	SESE2	Tall butterweed
<i>Polystichum lonchitis</i>	POLO4	Mountain holly-fern	<i>Senecio sphaerocephalus</i>	SESP4	Mountain marsh butterweed
<i>Polystichum mohrioides</i>	POMO9	Shasta fern	<i>Senecio streptanthifolius</i>	SEST3	Rocky Mountain butterweed
<i>Polystichum munitum imbricans</i>	POMUI4	Imbricate sword fern	<i>Senecio triangularis</i>	SETR	Arrowleaf groundsel
<i>Potentilla</i>	POTEN	Cinquefoil	<i>Sibbaldia procumbens</i>	SIPR	Creeping sibbaldia
<i>Potentilla arguta convallaria</i>	POARC	Tall cinquefoil	<i>Sidalcea oregana</i>	SIOR	Oregon checker-mallow
<i>Potentilla diversifolia</i>	PODI2	Diverse-leaved cinquefoil	<i>Silene</i>	SILEN	Campion or catchfly or silene
<i>Potentilla flabellifolia</i>	POFL3	Fringe leaf cinquefoil	<i>Silene acaulis</i>	SIAC	Moss campion
<i>Potentilla glandulosa</i>	POGL9	Sticky or gland cinquefoil	<i>Silene douglasii douglasii</i>	SIDO	Douglas' campion
<i>Potentilla gracilis</i>	POGR9	Slender cinquefoil	<i>Silene menziesii</i>	SIME	Menzie's campion
<i>Potentilla gracilis glabrata</i>	POGRG	Slender cinquefoil	<i>Silene oregana</i>	SIOR3	Oregon catchfly
<i>Potentilla ovina</i>	POOV2	Sheep cinquefoil	<i>Sisymbrium altissimum</i>	SIAL2	Jim Hill mustard or tumbled mustard
<i>Potentilla quinquefolia</i>	POQU	Snow cinquefoil	<i>Sisyrinchium inflatum</i>	SIIN15	Grass widows
<i>Pteridium aquilinum</i>	PTAQ	Braken or brake fern	<i>Smelowskia calycina americana</i>	SMCAA	Alpine smelowskia
<i>Pterospora andromedea</i>	PTAN2	Woodland pinedrops	<i>Smilacina racemosa</i>	SMRA	Western false Solomon's seal
<i>Pyrola</i>	PYROL	Pyrola or wintergreen	<i>Smilacina stellata</i>	SMST	Starry false Solomon's seal
<i>Pyrola asarifolia</i>	PYAS	Pink wintergreen	<i>Solidago</i>	SOLID	Goldenrod
<i>Pyrola dentata</i>	PYDE	Toothleaf wintergreen	<i>Solidago canadensis salebrosa</i>	SOCAS4	Canada or meadow goldenrod
<i>Pyrola minor</i>	PYMI	Snowline wintergreen	<i>Solidago missouriensis</i>	SOMI2	Missouri goldenrod
<i>Pyrola picta</i>	PYPI2	Whitevein wintergreen	<i>Solidago multiradiata scopulorum</i>	SOMUS2	Alpine goldenrod
<i>Pyrola secunda</i>	PYSE	Sidebells pyrola	<i>Spergularia rubra</i>	SPRU	Red sandspurry
<i>Pyrola uniflora</i>	PYUN	Woodnymph or single delight	<i>Spraguea umbellata</i>	SPUM	Pussypaws
<i>Ranunculus</i>	RANUN	Buttercup or crowfoot	<i>Spraguea umbellata caudicifera</i>	SPUMC	Pussypaws
<i>Ranunculus uncinatus parviflorus</i>	RAUNP	Little buttercup	<i>Stellaria</i>	STELL	Starwort or chickweed
			<i>Stellaria crispa</i>	STCR2	Crisped starwort
			<i>Stellaria jamesiana</i>	STJA3	Sticky chickweed
			<i>Stellaria obtusa</i>	STOB	Blunt sepaled starwort

<i>Stenanthium occidentale</i>	STOC	Western stenanthium
<i>Streptopus amplexifolius</i>	STAM2	Claspleaf twistedstalk
<i>Taraxacum officinale</i>	TAOF	Common dandelion
<i>Thalictrum occidentale</i>	THOC	Western meadowwue
<i>Thlaspi fendleri</i>	THFE3	Wild candytuft
<i>Tiarella trifoliata unifoliata</i>	TITRU2	Coolwort foamflower
<i>Townsendia montana</i>	TOMO	Mountain townsendia
<i>Tragopogon dubius</i>	TRDU	Yellow salsify, oysterplant
<i>Trautvetteria carolinensis</i>	TRCA	False bugbane
<i>Trifolium</i>	TRIFO	Clover or trefoil
<i>Trifolium eriocephalum</i>	TRER2	Woolyhead clover
<i>Trifolium longipes</i>	TRLO	Long stalked clover
<i>Trifolium longipes longipes</i>	TRLOL3	Long stalked clover
<i>Trifolium longipes multipedunculatum</i>	TRLOM3	Long stalked clover
<i>Trifolium longipes reflexum</i>	TRLOR3	Long stalked clover
<i>Trifolium multipedunculatum</i>	TRMU6	Many stalked clover
<i>Urtica dioica</i>	URDI	Stinging nettle
<i>Valeriana</i>	VALER	Valerian
<i>Valeriana edulis</i>	VAED	Edible valerian or tobacco root
<i>Valeriana sitchensis</i>	VASI	Sitka valerian
<i>Veratrum</i>	VERAT	False hellebore
<i>Veratrum californicum</i>	VECA2	California false hellebore
<i>Veratrum viride</i>	VEVI	Green false hellebore
<i>Verbascum thapsus</i>	VETH	Common mullein
<i>Veronica</i>	VERON	Speedwell
<i>Veronica cusickii</i>	VECU	Cusick's speedwell
<i>Veronica peregrina xalapensis</i>	VEPEX2	Purslane speedwell
<i>Veronica wormskjoldii</i>	VEWO2	American alpine speedwell
<i>Vicia americana</i>	VIAM	American vetch
<i>Vicia americana truncata</i>	VIAMT2	American vetch
<i>Viola</i>	VIOLA	Violet
<i>Viola adunca</i>	VIAD	Early blue violet
<i>Viola glabella</i>	VIGL	Woodland violet
<i>Viola orbiculata</i>	VIOR	Round leaved violet
<i>Viola purpurea</i>	VIPU4	Goosefoot or purplish violet
<i>Woodsia oregana</i>	WOOR	Oregon woodsia
<i>Xerophyllum tenax</i>	XETE	Beargrass
<i>Zigadenus elegans</i>	ZIEL2	Glaucous zygodenus
<i>Zigadenus paniculatus</i>	ZIPA2	Panicked deathcamas
<i>Zigadenus venenosus</i>	ZIVE	Deadly zigadenus or meadow deathcamas
<i>Zigadenus venenosus gramineus</i>	ZIVEG	Deadly zigadenus or meadow deathcamas

APPENDIX B

ECOCLASS Codes of Vegetation Types

Vegetation Type Code	Vegetation Type Common Name	Status	ECO-CLASS
TSME/VASC	Mountain hemlock/ grouse huckleberry	PA	CMS131
TSME/VAME	Mountain hemlock/big huckleberry	PA	CMS231
PIFL2/JUCO6	Limber pine/mountain juniper	PCT	CAS511
PIAL/RIMO2/POPU3	Whitebark pine/mountain polemonium	PA	CAS512
PIAL/VASC/LUHI4	Whitebark pine/grouse huckleberry/smooth woodrush	PA	CAS311
PIAL/FEV1	Whitebark pine/green fescue	PA	CAG221
PIAL/CAGE2	Whitebark pine/elk sedge	PA	CAG131
PIAL/ARAC2	Whitebark pine/prickly sandwort	PCT	CAF322
PIAL/VASC/ARCO9	Whitebark pine/grouse huckleberry/ heartleaf arnica	Comm	CAS312
PIAL/VASC/ARAC2	Whitebark pine/grouse huckleberry/ prickly sandwort	Comm	CAS313
PIAL/LUAR3	Whitebark pine/silvery lupine	Comm	CAF323
PIAL/JUCO6/ARNE	Whitebark pine/mountain juniper/ pinemat manzanita	Comm	CAS422
ABLA-PIAL/RIMO2/POPU3	Subalpine fir-whitebark pine/ mountain gooseberry/skunk-leaved polemonium	PCT	CAS611
ABLA-PIAL/VASC/ARCO9	Subalpine fir-whitebark pine/ grouse huckleberry/heartleaf arnica	PA	CAS621
ABLA-PIAL/VASC/CARO5	Subalpine fir-whitebark pine/ grouse huckleberry/Ross' sedge	PA	CAS622
ABLA-PIAL/VASC/ARAC2	Subalpine fir-whitebark pine/ grouse huckleberry/ prickly sandwort	PCT	CAS623
ABLA-PIAL/VASC-PHEM	Subalpine fir- whitebark pine/ grouse huckleberry- pink mountain heath	PCT	CAS624
ABLA2-PIAL/FEV1	Subalpine fir-whitebark pine/ green fescue	PA	CAG222
ABLA-PIAL/CAGE2	Subalpine fir-whitebark pine/ elk sedge	PA	CAG133
ABLA-PIAL/JUPA-STLE2	Subalpine fir - whitebark pine/Parry's rush- Lemmon's needlegrass	PA	CAG132
ABLA-PIAL/JUCO6-ARNE	Subalpine fir-whitebark pine/mountain juniper- pinemat manzanita	Comm	CAS423
ABLA-PIAL/JUCO6	Subalpine fir-whitebark pine/ mountain juniper	Comm	CAS424
ABLA-PIAL/VASC/FEV1	Subalpine fir-whitebark pine/ grouse huckleberry/ green fescue	Comm	CAS625
ABLA-PIAL/VASC/OREX	Subalpine fir- whitebark pine/grouse huckleberry/ little ricegrass	Comm	CAS626
ABLA-PIAL/VASC/LECOW	Subalpine fir-whitebark pine/ grouse huckleberry/ Wallowa lewisia	Comm	CAS627
ABLA-PIAL/ARAC2	Subalpine fir-whitebark pine/ prickly sandwort	Comm	CAF324

Vegetation Type Code	Vegetation Type Common Name	Status	ECO-CLASS	Vegetation Type Code	Vegetation Type Common Name	Status	ECO-CLASS
ABLA-PIAL/POPU3	Subalpine fir-whitebark pine/skunk-leaved polemonium	Comm	CAF0	PSME-PIPO-JUOC/FEID	Douglas-fir- ponderosa pine-western juniper/Idaho fescue	Comm	CDG333
ABLA-PIEN/LEGL	Subalpine fir-Engelmann spruce/ Labrador tea	PA	CES612	JUSC2/CELE3	Rocky Mountain juniper-curleaf mountain mahogany	Comm	CJS5
ABLA-PIEN/MEFE	Subalpine fir-Engelmann spruce/ fool's huckleberry	PA	CES2	POTR5/CAGE2	Quaking aspen/elk sedge	Comm	HQG112
ABLA-PIEN/CLUN2	Subalpine fir-Engelmann spruce/ queen's cup beadlilly	PA	CEF437	ABLA-PIAL/VASC-PHEM (AVALANCHE)	Subalpine fir-whitebark pine/ grouse huckleberry- pink mountain heath (avalanche)	Comm	CAS628
ABLA-PIEN/ARCO	Subalpine fir-Engelmann spruce/ heartleaf arnica	PA	CEF436	ABLA-PIAL/VASC/FEVI (AVALANCHE)	Subalpine fir-whitebark pine/ grouse huckleberry/ green fescue (avalanche)	Comm	CAS629
ABLA-PIEN/TRCA	Subalpine fir-Engelmann spruce/ False bugbane	Comm	CEF425	ABLA/VASC-PHEM (AVALANCHE)	Subalpine fir/grouse huckleberry -pink mountain heath (avalanche)	Comm	CES428
ABLA-PIEN/SETR	Subalpine fir-Engelmann spruce/ arrowleaf groundsel	Comm	CEF336	ABLA/FEVI (AVALANCHE)	Subalpine fir/ green fescue (avalanche)	Comm	CEG411
ABLA-PIEN/LIBO3	Subalpine fir-Engelmann spruce/ twinflower	Comm	CEF2	ABLA/JUPA (AVALANCHE)	Subalpine fir/ Parry's rush (avalanche)	Comm	CEG414
ABLA-PIEN/VASC-PHEM	Subalpine fir-Engelmann spruce/grouse huckleberry-pink mountain heath	Comm	CES427	PTAQ-CAHO	Bracken fern- Hood's sedge	Comm	FS8111
ABLA-PIEN/RHAL2	Subalpine fir- Engelmann spruce/ white rhododendron	Comm	CES215	MOOD	Mountain balm	Comm	FS8112
ABLA-PIEN/LUHI	Subalpine fir-Engelmann spruce/ smooth woodrush	Comm	CEG131	LINU4-CYTEF	Linanthastrum-cymopterus	Comm	FS1113
ABLA-PIEN/POPU3	Subalpine fir-Engelmann spruce/ skunk-leaved polemonium	Comm	CEF426	LINU4-ARLU	Linanthastrum - mountain mugwort	Comm	FS80
ABLA/LIBO3	Subalpine fir/twinflower	PA	CES414	LINU4-ARLO6	Linanthastrum-longleaf arnica	Comm	FS8115
ABLA/VAME	Subalpine fir/big huckleberry	PA	CES311	POFR4	Shrubby cinquefoil	Comm	SS60
ABLA/VASC-PHEM	Subalpine fir/grouse huckleberry-pink mountain heath	PA	CES428	ERFL4-PECO6	Golden buckwheat-coiled parrot's beak	Comm	FS8116
ABLA/VASC	Subalpine fir/grouse huckleberry	PA	CES411	POPH-FEVI	Alpine fleecflower-green fescue	Comm	FS5912
ABLA/ARCO	Subalpine fir/heartleaf arnica	PA	CEF435	POPH-CARU-CAGE2	Alpine fleecflower - pinegrass-elk sedge	Comm	FS5913
ABLA/CARU	Subalpine fir/pinegrass	PA	CEG312	POPH-CAGE2-LINU4	Alpine fleecflower- elk sedge- linanthastrum	Comm	FS5914
ABLA/CAGE2	Subalpine fir/elk sedge	PA	CAG111	POPH-AGUR-LINU4	Alpine fleecflower- horsemint- linanthastrum	Comm	FS5915
ABLA/POPU	Subalpine fir/skunk-leaved polemonium	PA	CEF411	POPH	Alpine fleecflower (cornices)	Comm	FS5916
ABLA-PIMO3/CHUM	Subalpine fir -western white pine/ prince's pine	Comm	CES8	CAHO5-BRCA5	Hood's sedge- mountain brome	Comm	GS61
ABLA/XETE	Subalpine fir/beargrass	Comm	CEF111	CAHO5-CAGE2	Hood's sedge- elk sedge	Comm	GS62
ABLA/ARNE/ARAC2	Subalpine fir/pinemat manzanita/ prickly sandwort	Comm	CES429	CAHO5-POGL9	Hood's sedge- sticky cinquefoil	Comm	GS63
ABLA/FEVI	Subalpine fir/ green fescue	Comm	CEG411	FELLFIELD	Fellfield communities	Comm	GS60
ABLA/POPH	Subalpine fir/ alpine fleecflower	Comm	CEF511	TURF	Turf communities	Comm	GS70
ABLA/JUDR	Subalpine fir/Drummond's rush	Comm	CEG412	SCREE	Scree communities	Comm	FS90
ABLA/JUTE	Subalpine fir/ slender rush	Comm	CEG413	PHLOX-CYTEF	Phlox- cymopterus	Comm	FS8117
ABLA/STOC	Subalpine fir/western needlegrass	Comm	CEG323	PHLOX-IVGO	Phlox-ivesia	Comm	FS8118
ABGR/CAGE2	Grand fir/elk sedge	PA	CWG111	ROCK OUTCROP	Rock outcrop communities	Comm	FS91
ABGR/CARU	Grand fir/pinegrass	PA	CWG112	GRUS	Grus communities	Comm	FS92
ABGR/VAME	Grand fir/big huckleberry	PA	CWS211	CELE3/CAGE2	Mountain mahogany/elk sedge	Comm	SD4113
PSME/ARNE/CAGE2	Douglas-fir/pinemat manzanita/elk sedge	PA	CDS664	CELE3/FEID-AGSP	Mountain mahogany/Idaho fescue-bluebunch wheatgrass	PA	SD4111
PSME/CARU	Douglas-fir/pinegrass	PA	CDG121	ARTRV-SYOR2/BRCA5	Mountain big sagebrush-mountain snowberry/mountain brome	PCT	SD2917
PSME/ACGL-SYOR2	Douglas-fir/Rocky Mountain maple-mountain snowberry	Comm	CDS725	ARTRV/CAGE2	Mountain big sagebrush/elk sedge	PA	SS4911
PSME/SYOR2/CAGE2	Douglas-fir/mountain snowberry/ elk sedge	Comm	CDS642	ARTRV/FEVI	Mountain big sagebrush/ green fescue	PCT	SS4915
PSME/RIMO2/POPU3	Douglas-fir/mountain gooseberry/ skunk-leaved polemonium	Comm	CDS911				

Vegetation Type Code	Vegetation Type Common Name	Status	ECO-CLASS
ARTRV/FEID-AGSP	Mountain big sagebrush/Idaho fescue-bluebunch wheatgrass	PA	SD2911
ARTRV/BRCA5	Mountain big sagebrush/mountain brome	PCT	SS4914
ARTRV/CAHO5	Mountain big sagebrush/ Hood's sedge	PCT	SS4916
ARTRV/LINU4	Mountain big sagebrush/ linanthastrum	PCT	SS4917
ARTRV/ERFL4-PHLOX	Mountain big sagebrush/golden buckwheat-phlox	Comm	SS4918
ARAR8/FEID-AGSP	Low sagebrush/Idaho fescue-bluebunch wheatgrass	PA	SD1911
POFR4/FEID	Shrubby cinquefoil/Idaho fescue	PCT	SS4919
SYOR2	Mountain snowberry	Comm	SM32
PREM	Bitter cherry	Comm	SM34
JUCO6	Common juniper	Comm	CJC1
FEVI	Green fescue	PA	GS11
FEVI-LULA3	Green fescue- spurred lupine	PA	GS1112
FEVI-JUPA	Green fescue- Parry's rush	PA	GS1113
FEVI-CARO5	Green fescue- Ross' sedge	PCT	GS1114
FEVI-CAHO5	Green fescue-Hood's sedge	PCT	GS1111
FEVI-PENST	Green fescue- penstemon	PCT	GS1115
FEVI-STOC	Green fescue - western needlegrass	PCT	GS1116
FEVI-LICA2	Green fescue-Canby's lovage	Comm	GS1117
FEVI-AGCA2	Green fescue-bearded wheatgrass	Comm	GS1118
FEVI-CASC12	Green fescue-Holm's Rocky Mountain sedge	Comm	GS1119
FEID-DAIN-CAPE7	Idaho fescue-timber oatgrass-Liddon's sedge	PA	GB5920
FEID-KOCR (HIGH)	Idaho fescue-prairie junegrass (high elevation)	PA	GB5913
FEID-GETR	Idaho fescue- red avens	PCT	GB5923
FEID-PESP2	Idaho fescue-Wallowa penstemon	PCT	GB5924
FEID-CAHO5	Idaho fescue-Hood's sedge	PA	GB5921
FEID-AGSP-CYTEF	Idaho fescue-bluebunch wheatgrass-cymopterus	PA	GB5925
FEID-AGSP-FRALC2	Idhao fescue-bluebunch wheatgrass- Cusick's frasera	PA	GB5926
FEID-AGSP-PONEW	Idaho fescue- bluebunch wheatgrass-Wheeler's bluegrass	Comm	GB5927
MEBU-STOC	Oniongrass-needlegrass	Comm	GB5011
STOC-SIHY	Western needlegrass-squirreltail	Comm	GS50
POSA12-SELA	Sandberg's bluegrass- lance-leaved stonecrop	Comm	GB9112
FESC-FEID	Rough fescue-Idaho fescue	Comm	GB6011
CAGE2-FEID	Elk sedge-Idaho fescue	Comm	GS3912
CAGE2-JUPA	Elk sedge- Parry's rush	Comm	GS3913
CAGE2-CARU	Elk sedge-pinegrass	Comm	GS3914
CAGE2-POCU3	Elk sedge - Cusick's bluegrass	Comm	GS3915
CAGE2-PHAU3	Elk sedge-desert phlox	Comm	GS3916
CAGE2-STOC	Elk sedge- western needlegrass	Comm	GS3917
CAREX-STOC	Alpine sedges-western needlegrass	Comm	GS4011
CAHO5-BRCA5 (MEADOW)	Hood's sedge-mountain brome (meadow)	Comm	GS4012
JUPA-AGGL	Parry's rush-pale agoseris	Comm	GS4013
LEPY2-MAGL2	Pygmy lewisia- tarweed	Comm	FS8113
RUOC2-MAGL2	Western coneflower- cluster tarweed	Comm	FS81

Alpine and Subalpine Vegetation

of the Wallowa, Seven Devils and Blue Mountains



“When the tree line is passed at 9000 feet, the last tree seen is the whitebark pine. Ancient patriarchs, long dead, mark some ridges. For decades on end they stand erect even after life has passed. The live ones are bent, gnarled and dwarfed... the one tree of our western mountains that seems to thrive on adversity.”

William O. Douglas - 1960

